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THESIS

ANALYSIS OF NAVAL SURFACE FORCES, PACIFIC
AFLOAT INTERMEDIATE MAINTENANCE ACTIVITY
"REPAIR OF OTHER VESSEL"
COST ESTIMATION PROCESS

by

Gary Michael Hall

December 1986

Thesis Advisor: Kenneth J. Euske

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This study analyzes the Repair of Other Vessel (ROV) estimation procedures used by Commander, Naval Surface Forces U.S. Pacific Fleet (COMANAVSURFPAC) afloat Intermediate Maintenance (IMA).Data were gathered through archival research and interviews of fleet and staff personnel. The objective of the thesis was to investigate if a model based upon archival data could be developed which would improve the IMA ROV estimates to a level of 80% accuracy. Such a model was not found. However, the elimination of one IMA report and additional research of the function of the IMA ROV estimates and SUADPS reports were recommended.

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Analysis of Naval Surface Forces, Pacific Afloat Intermediate Maintenance Activity "Repair of Other Vessel" Cost Estimation Process

by

Gary M. Hall
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 1972

Submitted in partial fulfillment of the
requirements for the degree of

MASTER OF SCIENCE IN MANAGEMENT

from the

NAVAL POSTGRADUATE SCHOOL
December 1986

ABSTRACT

This study analyzes the Repair of Other Vessel (ROV) estimation procedures used by Commander, Naval Surface Forces U.S. Pacific Fleet (COMNAVSURFPAC) afloat Intermediate Maintenance Activities (IMA). Data were gathered through archival research and interviews of fleet and staff personnel. The objective of the thesis was to investigate if a model based upon archival data could be developed which would improve the IMA ROV estimates to a level of 80% accuracy. Such a model was not found. However, the elimination of one IMA report and additional research of the function of the IMA ROV estimates and SUADPS reports were recommended.

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I. BACKGROUND

A. INTRODUCTION

The purpose of this chapter is to describe the thesis objective and the sources and uses of ROV funds. First, the objectives of this thesis and the general reasons for ROV fund requests are described. Next, the guidance provided and the procedures used by IMA's for ROV fund estimation is discussed. Finally, the COMNAVSURFPAC ROV fund reporting, recording, and comparing processes are described. The information for this section was obtained from official COMNAVSURFPAC and Commander-in-Chief, U.S. Pacific Fleet (CINCPACFLT) instructions as noted below and from conversations with members of the COMNAVSURFPAC staff and COMNAVSURFPAC IMA Supply Officers.

B. THESIS OBJECTIVE

The purpose of this thesis is to analyze the cost estimation process used by Commander, Naval Surface Forces U.S. Pacific Fleet (COMNAVSURFPAC) Intermediate Maintenance Activities (IMA) to budget for quarterly "Repair of Other Vessel" (ROV) funds. Specifically, the research has two primary objectives: The first is to determine if there is a model which COMNAVSURFPAC IMA's can use to estimate quarterly ROV costs with greater than eighty per cent accuracy. The second objective is to make recommendations to COMNAVSURFPAC for improvement of the present IMA ROV cost estimation process.

The present cost estimation system used by COMNAVSURFPAC IMA's results in an average accuracy of about sixty-five percent when actual obligations are compared to IMA estimated obligations for ROV funds. COMNAVSURFPAC desires to improve IMA ROV estimates to eighty percent or better accuracy. The improved estimates would enable COMNAVSURFPAC to eliminate fifteen percent of their budgetary slack and improve their ability to anticipate the need for augmentations or returns of unneeded funds to CINCPACFLT.

C. SOURCE OF ROV FUNDS

Funding requirements for intermediate maintenance of all U.S. Navy ships are included in the annual Department of the Navy budget submission to Congress as an Operation and Maintenance, Navy (O&MN) line item. As part of the annual CINCPACFLT O&MN budget request to the Chief of Naval Operations (CNO), estimated funding necessary for intermediate maintenance of Pacific Fleet ships is identified and officially requested. A portion of the total intermediate maintenance funds requested by CINCPACFLT is for the cost of materials needed by

COMNAVSURFPAC afloat Ship Intermediate Maintenance Activities (SIMA) for repairing ships. CINCPACFLT calls the cost of materials needed by IMA's to repair ships Repair of Other Vessel (ROV) funds. CINCPACFLT's administrative and accounting guidance regarding ROV funds is contained in CINCPACFLT Instruction 7042.1B: Intermediate Maintenance Activity (IMA) ROV Funds; administration and accounting for. In the instruction, CINCPACFLT specifies materials that can and cannot be charged to the ROV account. Based on the annual allocation, from the CNO, CINCPACFLT grants COMNAVSURFPAC an annual "operating budget" for Repair of Other Vessel (ROV) materials.

COMNAVSURFPAC grants each IMA a quarterly Operating Target (OPTAR) to pay ROV costs as directed by the Department of the Navy Office of the Comptroller (NAVCOMPT) Operating Procedures Publication, NAVSO P-3013-2. The publication states COMNAVSURFPAC

> will grant an operating target (OPTAR) to tenders and repair ships...to fund the cost of materials required in the performance of ROV. [Ref. 1:pp. 4-119]

The size of the grant is based upon quarterly requests for ROV funds submitted by the IMA's. Each IMA submits a ROV financial plan, which is a request for funding, to the COMNAVSURFPAC Comptroller ten days prior to the beginning of each quarter. [Ref. 2:pp.4-5].

D. ROV FUND CATEGORIES

The IMA's are required by the Force Supply Manual (COMNAVSURFPAC Instruction 4400.1E) to estimate costs in the following ROV categories:

1. Alongside Availability (ROV Direct)
2. Ship-to-Shop Availability (ROV Direct)
3. Concurrent Availability (ROV Direct)
4. Self Availability (TAV)
5. ROVI (ROV Indirect)

An Alongside Availability is one which the IMA sends people aboard the customer ship to repair the customer ship. A Ship-to-Shop Availability is one which the IMA repairs items which can be delivered to the IMA by the customer ship. Alongside availabilities are normally more extensive than ship-to-shop availabilities because the scope of the work can be greater during alongside availabilities. ROV Direct items are materials issued to the Repair/Production Department for authorized work on a customer ship. A Concurrent Availability is a period when the customer ship is undergoing major repairs by a depot level repair activity and is assigned to an IMA for concurrent repairs. The Self Availability (TAV) category above includes materials used by a repair ship IMA for repairs on itself during an authorized self repair availability period. ROV Indirect funds are used for those materials which because of their nature cannot be related to a specific job order or benefiting ship. Individual Unit Identification Codes (UIC's) are utilized to collect and maintain ROV charges, by category, to enable final costing of all completed jobs funded through the IMA ROV account. ROV Direct costs are charged to the UIC of the individual customer ship, while TAV and ROV Indirect costs are charged to the IMA's UIC.

E. IMA ROV REQUESTS

No specific guidance has been issued to COMNAVSURFPAC IMA's regarding methods for estimating ROV costs. IMA's are given quarterly ROV OPTAR grants based on the quarterly IMA request and funds remaining in COMNAVSURFPAC's ROV operating budget. There is a COMNAVSURFPAC provision for requesting a ROV OPTAR augmentation. The procedure and format are similar to the original quarterly request. However, the augment request must include justification comments explaining why additional funds are needed.

Each IMA is given a quarterly schedule of ships assigned for repair availabilities. The schedule includes the type of repair availability (alongside, ship-to-shop, or concurrent), the dates of the availability and name and type of ship to be repaired. The IMA's receive quarterly repair schedules about a month prior to the COMNAVSURFPAC deadline for IMA quarterly ROV fund request. The IMA's use the schedule to develop an estimate for each ROV category.

F. IMA ROV COST ESTIMATION PROCESS

The method of estimation of ROV costs is unique to each individual IMA. Most of the methods are similar in that they use a daily rate for the ROV and ROVI categories. The daily rate is then multiplied times the number of days a customer ship is scheduled for a repair availability. The estimates are totaled in each category and submitted to COMNAVSURFPAC as the quarterly ROV OPTAR request. The development of the daily rates by the maintenance activities included in this study varied but usually considered some combination of the following:

1. Size of the ship to be repaired: large, medium, small.
2. Type of propulsion generation system: steam, diesel, gas turbine, nuclear.
3. Type of availability: alongside, ship-to-shop, concurrent.
4. Amount and type of work done for a similar type ship in the past.

TABLE 1 lists some of the daily rates presently used by some of the IMA's included in this study. In addition to the standard rates listed in TABLE 1, some maintenance activities add the cost of specific high cost items (e.g., a main feed pump rotor $50,000) to their estimate when it is know that the item will be needed for a specific ship's availability. No two IMA's use the same rate for their estimates.

TABLE 1

STANDARD RATES USED BY IMA'S TO ESTIMATE ROV COSTS

SHIP	TYPE OF FUNDS	DAILY RATE USED
AJAX(AR-6)	ROV DIRECT	$2100/DAY: AJAX WAS DEPLOYED $3000/DAY WHEN NOT DEPLOYED
	ROV INDIRECT	50% OF ROV DIRECT COSTS
PRAIRIE (AD-15)	ROV DIRECT FOR ALONGSIDE AVAIL OF A SMALL SIZE SHIP	$400/DAY
	ROV DIRECT FOR ALONGSIDE AVAIL OF A MEDIUM SIZE SHIP	$600/DAY
	ROV DIRECT FOR ALONGSIDE AVAIL OF A LARGE SIZE SHIP	$800/DAY
	TAV(SELF-AVAIL)	$700/DAY
	ROV DIRECT FOR SHIP-TO-SHOP AVAIL, ALL SIZES OF SHIPS	$400/DAY
CAPE COD (AD-43)	ROV DIRECT FOR ALL AVAILABILITIES	$35/DAY
SAMUEL GOMPERS (AD-37)	ROV DIRECT FOR ALL AVAILABILITIES	$2440/DAY
	ROV INDIRECT FOR ALL AVAILABILITIES	$720/DAY

G. RECORDING AND REPORTING ROV COSTS

COMNAVSURFPAC requires each IMA to report monthly, by message, actual ROV obligations. The IMA's also submit monthly Shipboard Uniform Automated Data Processing System (SUADPS) reports to COMNAVSURFPAC which contain the same information. The reported actual obligations are a summation of all material coded as ROV material that was ordered by the IMA's crew during that month. The ROV coding takes place in the work center that identifies the need for the material. A person in the workcenter fills out a DD Form 1250 listing the needed material's National Stock Number (NSN), the work center ordering the material, the cost of the material, the UIC of the ship that the material will used to repair, and whether or not it is ROV material. The authorizing authority for the purchase of the item, normally the Division Officer, signs the DD Form 1250. It is then taken to the Supply Support Center. At the Supply Support Center, a check is made to determine onboard availability. If in stock, the item is issued. If the item is not carried or not in stock, the requisition is referred to the supply system. In either case, the standard price or purchase price of the material is obligated against available ROV OPTAR funds by processing the DD Form 1250 data through SUADPS. As part of the normal month-end close out procedures, monthly obligation reports are produced from SUADPS. Two of these reports, Report Seven and Report Eight contain ROV obligation data. IMA's mail Reports Seven and Eight along with all other financial obligation reports to COMNAVSURFPAC and the Fleet Accounting and Disbursing Center, Pacific (FAADCPAC), the Authorization Accounting Activity (AAA), monthly.

ROV obligation totals sent monthly to COMNAVSURFPAC by the IMA's are used by the COMNAVSURFPAC Comptroller to monitor ROV total obligations. He does this by comparing the total ROV operating budget authorized by CINCPACFLT to the total obligations made by all of the COMNAVSURFPAC IMA's. COMNAVSURFPAC accomplishes this monitoring of funds by comparing the total percent of the fiscal year expended compared to the total percent of ROV funds expended.

Based upon the information in this chapter, two possible alternatives for attaining the objective of this Thesis became apparent to the researcher. The two alternatives are discussed in the next chapter: Alternatives for Attaining the Thesis Objective.

II. ALTERNATIVES FOR ATTAINING THE THESIS OBJECTIVES

A. INTRODUCTION

The purpose of this chapter is to explain the process that was used in selecting an approach for completing the thesis objectives. The objectives of this thesis are to determine if there is a model IMA's can use to estimate their ROV costs with greater than eighty percent accuracy and to make a recommendation concerning the improvement of the current IMA ROV cost estimation process. Based on the background information and the data available, it became apparent that there were two possible alternatives for completing the thesis. First, the two basic alternatives analyzed are discussed. Then the costs associated with each of the two alternatives and the reasons for the selection of the alternative selected are described. Lastly, the method of modeling the alternative selected is described.

B. DESCRIPTION OF ALTERNATIVES

Possible alternatives for attaining the objectives remained open throughout the analysis. Two alternatives for attaining the stated thesis objectives which became apparent from the process of gathering and analyzing the datum are as follows:

1. Continue the present cost estimation procedure which involves each IMA using its own method but COMNAVSURFPAC tell IMA's that their goal is eighty percent or better accuracy in estimating actual ROV costs.
2. Develop a model for estimating costs based on historical information by correlating one or more variables with actual costs and using this relationship to estimate actual costs.

C. ALTERNATIVE ONE: READILY IDENTIFIABLE COSTS

The costs associated with each of these alternatives were considered. Although many costs can be readily identified and put into understandable terms, there are some costs that cannot be identified or easily quantified. The costs that could be readily identified for alternative one (i.e., leave the cost estimation process as is but give the IMA's a goal of eighty percent accuracy) are:

1. The cost of the additional manhours required to track, compute, control and report estimates versus actual ROV costs.
2. The cost of rejecting needed work for a ship scheduled for an availability that is identified after the ROV cost estimate is made. This would occur if the IMA determined that they had to stay within their original cost estimate for the availability.
3. The cost of doing additional low priority jobs just to ensure an eighty percent accuracy.

D. ALTERNATIVE ONE: NOT READILY IDENTIFIABLE COSTS

Costs that cannot be readily calculated but must be considered, include the following:

1. Morale changes of IMA workers associated with the vigorous pursuit of an eighty percent accuracy estimate for ROV cost and the

possible impact upon the goals for quality of work or best job at least cost.

2. Morale of the crews of the ships being repaired associated with trying to attain an objective that could be contradictory to their goal of readiness at any cost.

E. ALTERNATIVE TWO: READILY IDENTIFIABLE COSTS

Costs that can be identified and quantified associated with alternative two (i.e., using a model based on historical data to estimate ROV costs) are as follows:

1. The cost of the manhours needed to collect, analyze and report historical data on actual and estimated ROV costs.
2. The cost of the manhours required to promulgate new procedures and train IMA Supply Officers to use a different cost estimation process.

F. ALTERNATIVE TWO: NOT READILY IDENTIFIABLE COSTS

Costs that cannot be readily quantified but must be considered, include the following costs:

1. The administrative cost of requesting an ROV fund augmentation which caused by unplanned repairs that cannot be absorbed by the loss of a thirty-five percent budgetary slack if a greater accuracy in estimating is achieved.
2. The cost of changes in morale of IMA workers and crews of the ships being repaired resulting from work delays while waiting for approval of an augmentation request which was necessitated by the loss of the thirty-five percent budgetary slack.
3. The cost of rejection of work by the IMA because work approval authority at the IMA evaluates that the IMA's margin for error and flexibility have been narrowed due to the more stringent cost estimation requirement.

G. SELECTION OF AN ALTERNATIVE

Alternative two was selected because the cost of a graduate student collecting data and attempting to build a cost estimation model as thesis work is less expensive than having Supply Officers and their organizations at IMA's controlling, collecting and reporting data on a trial basis.

H. METHOD OF MODELING THE SELECTED ALTERNATIVE

Developing a model which captures the essence of the cost estimation problem is the focus of this thesis effort. Such a model, if developed, would afford the user a medium to investigate the results and costs of changes in the cost estimation system without altering the actual system. Parameters that were available according to COMNAVSURFPAC staff officers and IMA Supply Officers included: name and type of IMA, hull numbers and types of ship being repaired, deployment status and homeport of the IMA, and type of recurring work done by IMA's.

The method of modeling in this case attempts to identify a mathematical relationship between one or more variable and the actual ROV costs of an IMA. The statistics program MINITAB was used to determine if relationships existed between the variables and actual ROV costs. The next chapter discusses the research method.

III. RESEARCH METHOD

The research methods followed in this project consisted of a series of semi-structured interviews with selected members of the COMNAVSURFPAC staff and management of Destroyer Tenders and Shore Intermediate Maintenance Activities (SIMA) and the analysis of archival data. The interviews included discussions of ROV cost estimation procedures, actual ROV cost recording and reporting procedures, and criteria used by the IMA to accept or reject work requested by a ship scheduled for an availability. The interviews which were conducted by the author, consisted of a series of questions which were provided prior to the interviews followed by an open question and answer period. The prepared questions provided prior to the interview are contained in Appendix A. The answers to the questions were recorded by the author after each interview was completed. Written notes regarding open discussion topics were recorded during the discussions.

Data on actual ROV costs were obtained from the Fleet Accounting and Disbursing Center, Pacific (FAADCPAC) by examination of IMA monthly Shipboard Uniform Automated Data Processing System (SUADPS) Reports Seven and Eight. COMNAVSURFPAC and

CINCPACFLT directives were examined to determine the guidance given to IMA's for estimating ROV costs.

IV. COLLECTION AND PREPARATION OF DATA

A. INTRODUCTION

This chapter discusses how estimated and actual IMA Repair of Other Vessels (ROV) cost data were gathered and prepared for analysis. The types of available data were determined during interviews by discussing the cost estimation problem with members of the COMNAVSURFPAC Comptroller staff, IMA Supply and Assistant Supply Officers and a supervisor at the Fleet Accounting and Disbursing Center, Pacific (FAADCPAC). The interviews are discussed in the Data Gathering section of this chapter. From these discussions, it became apparent that the following data, which are applicable to ROV cost estimation, were available from IMA, FAADCPAC, and COMNAVSURFPAC files:

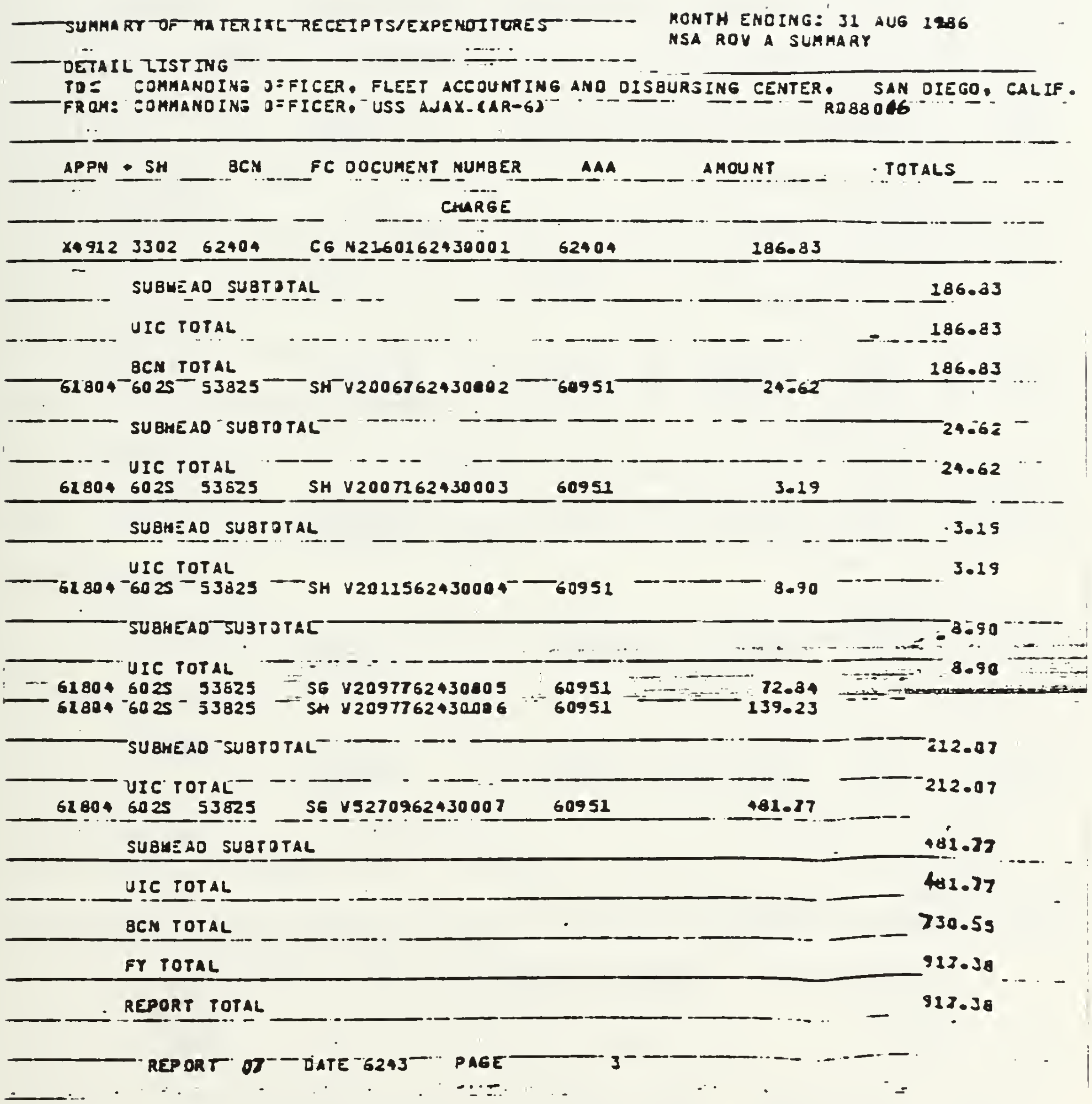
1. IMA quarterly estimates of ROV costs.
2. IMA ROV funds augmentation requests.
3. IMA monthly SUADPS Reports Seven and Eight listing IMA ROV obligations for each ship scheduled for or being repaired.
4. IMA monthly ROV obligation report (message) to COMNAVSURFPAC Comptroller.
5. CINCPACFLT's annual ROV allocation to COMNAVSURFPAC.
6. Deployment schedules of IMA's.
7. Homeports of IMA's.

8. Working knowledge of both COMNAVSURFPAC staff and Supply Officers of IMA's.

B. DATA GATHERING

SUADPS Reports Seven and Eight are maintained for two years by FAADCPAC located in San Diego. The author travelled to San Diego and gathered the data reported by ship IMA's from their monthly SUADPS reports. Each file provided by FAADCPAC contained one repair ship's accounting reports for one month. SUADPS reports Seven and Eight contained the Unit Identification Code (UIC) of the customer ships for which the IMA had obligated ROV funds. Next to the UIC of the customer ship was listed the total amount of ROV funds (Direct) obligated for that UIC during the month of the report. Next to the UIC of the IMA the total ROV funds (TAV and ROVI) obligated during that month was listed. The total aggregated ROV obligations for all the UIC's for the month was also listed (Direct + ROVI + TAV). Figure 1 is an example of SUADPS Reports Seven and Figure 2 is an example of SUADPS Report Eight.

The results of two days of gathering data were one hundred and fifty-one rows of ten columns each of data. Appendix B contains the data gathered. Each of these rows contained information pertaining to one availability performed by an IMA on a specific customer ship. In addition, monthly totals of ROV estimates and obligations for each IMA were gathered from FAADCPAC and COMNAVSURFPAC files.



```
SUMMARY OF MATERIAL RECEIPTS/EXPENDITURES        MONTH ENDING: 31 AUG 1986
                                                 NSA ROV A SUMMARY
DETAIL LISTING
TO:   COMMANDING OFFICER, FLEET ACCOUNTING AND DISBURSING CENTER,   SAN DIEGO, CALIF.
FROM: COMMANDING OFFICER, USS AJAX (AR-6)                            RD88006

APPN + SH    BCN    FC DOCUMENT NUMBER    AAA        AMOUNT        TOTALS

                                CHARGE

X4912 3302  62404   CG N2160162430001     62404      186.83

         SUBHEAD SUBTOTAL                                          186.83

         UIC TOTAL                                                 186.83

         BCN TOTAL                                                 186.83
61804 602S  53825   SH V2006762430002     60951       24.62

         SUBHEAD SUBTOTAL                                           24.62

         UIC TOTAL                                                  24.62
61804 602S  53825   SH V2007162430003     60951        3.19

         SUBHEAD SUBTOTAL                                            3.15

         UIC TOTAL                                                   3.19
61804 602S  53825   SH V2011562430004     60951        8.90

         SUBHEAD SUBTOTAL                                            8.90

         UIC TOTAL                                                   8.90
61804 602S  53825   SG V2097762430005     60951       72.84
61804 602S  53825   SH V2097762430006     60951      139.23

         SUBHEAD SUBTOTAL                                          212.07

         UIC TOTAL                                                 212.07
61804 602S  53825   SG V5270962430007     60951      481.77

         SUBHEAD SUBTOTAL                                          481.77

         UIC TOTAL                                                 481.77

         BCN TOTAL                                                 730.55

         FY TOTAL                                                  917.38

         REPORT TOTAL                                              917.38

           REPORT 07   DATE 6243    PAGE        3
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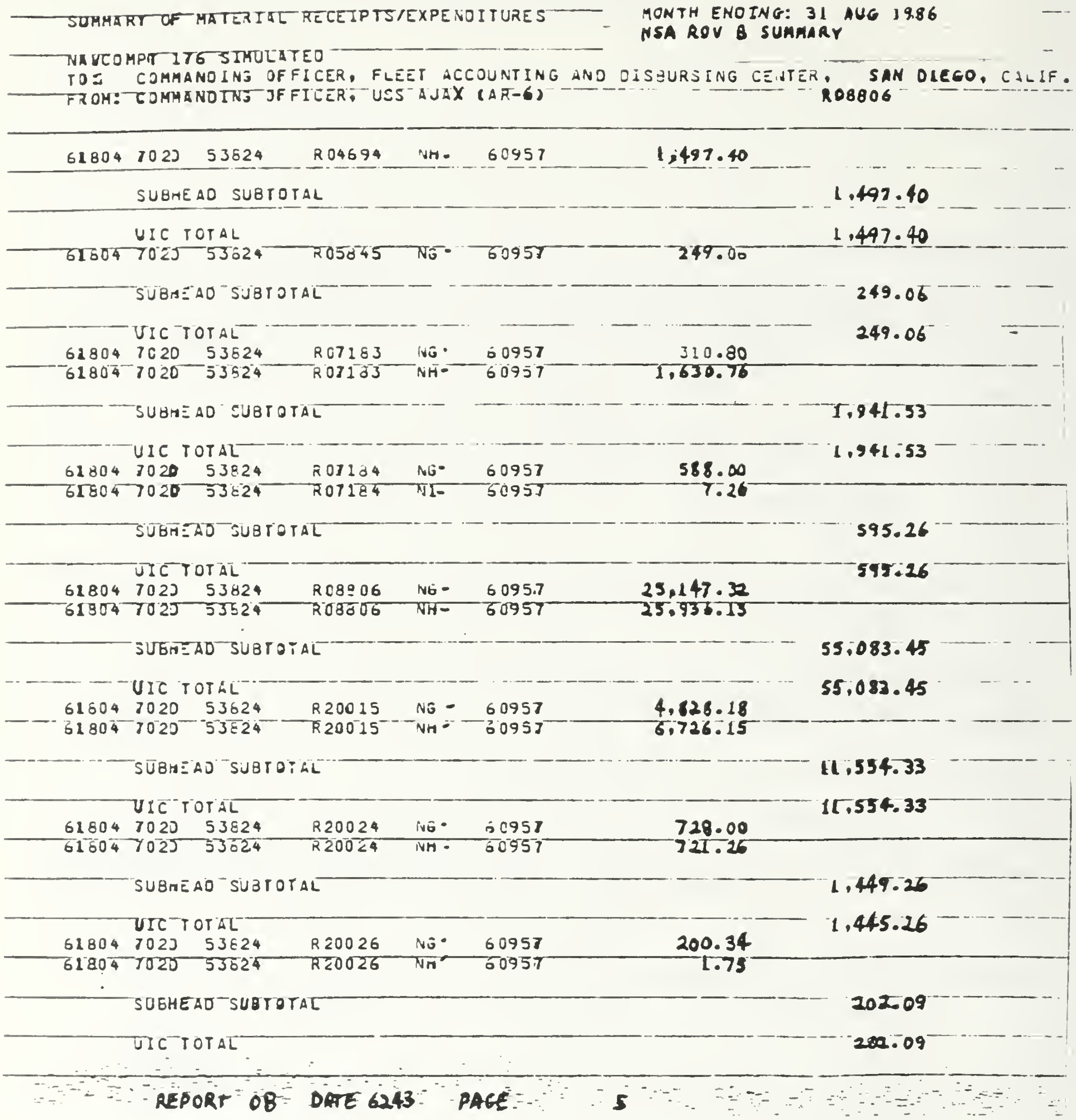
Figure 1. Sample SUADPS Report Seven



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SUMMARY OF MATERIAL RECEIPTS/EXPENDITURES        MONTH ENDING: 31 AUG 1986
                                                 NSA ROV 8 SUMMARY
NAVCOMPT 176 SIMULATED
TO:   COMMANDING OFFICER, FLEET ACCOUNTING AND DISBURSING CENTER,  SAN DIEGO, CALIF.
FROM: COMMANDING OFFICER, USS AJAX (AR-6)                              R08806

61804 7020  53824     R04694   NH-   60957          1,497.40

      SUBHEAD SUBTOTAL                                          1,497.40

      UIC TOTAL                                                 1,497.40
61804 7020  53824     R05845   NG-   60957            249.06

      SUBHEAD SUBTOTAL                                            249.06

      UIC TOTAL                                                   249.06
61804 7020  53824     R07183   NG-   60957            310.80
61804 7020  53824     R07183   NH-   60957          1,630.76

      SUBHEAD SUBTOTAL                                          1,941.53

      UIC TOTAL                                                 1,941.53
61804 7020  53824     R07184   NG-   60957            588.00
61804 7020  53824     R07184   NI-   60957              7.26

      SUBHEAD SUBTOTAL                                            595.26

      UIC TOTAL                                                   595.26
61804 7020  53824     R08806   NG-   60957         25,147.32
61804 7020  53824     R08806   NH-   60957         25,936.13

      SUBHEAD SUBTOTAL                                         55,083.45

      UIC TOTAL                                                55,083.45
61804 7020  53824     R20015   NG-   60957          4,828.18
61804 7020  53824     R20015   NH-   60957          6,726.15

      SUBHEAD SUBTOTAL                                         11,554.33

      UIC TOTAL                                                11,554.33
61804 7020  53824     R20024   NG-   60957            728.00
61804 7020  53824     R20024   NH-   60957            721.26

      SUBHEAD SUBTOTAL                                          1,449.26

      UIC TOTAL                                                 1,445.26
61804 7020  53824     R20026   NG-   60957            200.34
61804 7020  53824     R20026   NH-   60957              1.75

      SUBHEAD SUBTOTAL                                            202.09

      UIC TOTAL                                                   202.09

      REPORT 08   DATE 6243   PAGE        5
```

Figure 2. Sample SUADPS Report Eight

IMA Supply Officers pointed out that ROV obligations for customer ships sometimes were made as early as two months prior to the start of the repair availability. A scan of the SUADPS reports confirmed that some obligations were made one and two months prior to the beginning of the quarter in which the availability was scheduled. A check of SUADPS Reports Seven and Eight for three months ahead of the scheduled availability quarter revealed that IMA's had made no obligations that far in advance for a customer ship. Based on this information, the author decided to collect individual customer ship obligation data by using ROV (Direct) obligations charged to the customer ship UIC two months prior to the quarter of the availability and ROV (Direct) obligations charged during the three months of the quarter in which the availability was scheduled. The sum of this five months of obligations would be used as the total IMA obligation for the customer ship's availability.

At FAADCPAC the author encountered an unanticipated problem with gathering data. FAADCPAC does not maintain obligation reports for Shore Intermediate Maintenance Activities (SIMA's). However, there was enough information available to continue the thesis but the obligation data for each individual ship repaired would have to be limited to afloat IMA's, the Destroyer Tenders. The Destroyer Tenders performing the repairs were USS AJAX (AR-6), USS HECTOR(AR-7), USS JASON (AR-8), USS CAPE COD (AD-43), AND USS PRAIRIE (AD-15). The data collected on individual customer ship availabilities were for one hundred and fifty-one availabilities performed by five Destroyer Tender IMA's on twenty-six different ship classes.

COMNAVSURFPAC's Comptroller's office provided copies of IMA ROV quarterly and augmentation request messages for the period January 1984 through June 1986. Appendix C is a sample of the messages provided by COMNAVSURFPAC. COMNAVSURFPAC also provided the homeports and deployment status of each IMA.

A series of semi-structured interviews were held with members of COMNAVSURFPAC's staff and Supply and Repair Officers of Intermediate Maintenance Activities. These discussions included ROV cost estimation procedures, actual cost accumulation and required reports. The interviews were conducted by the author and consisted of discussion based on a series of questions (see Appendix D) which were provided by the author prior to the interviews. In addition, COMNAVSURFPAC Comptroller requested IMA Supply Officers, not interviewed by the author, to answer the questions contained in Appendix A.

Answers to the questions were sent directly to the author by the IMA Supply Officers and they also sent a copy of their replies to the COMNAVSURFPAC Comptroller. Appendix E contains the replies from the IMA's.

C. DATA PREPARATION

ROV obligation data for each of the five months of the data collection period were gathered and summed. This summation was used as the total IMA obligation for the customer ship's availability. Because IMA's submit ROV funding requests to COMNAVSURFPAC quarterly, the monthly obligations from the COMNAVSURFPAC and the FAADCPAC files were restructured into quarterly totals so the aggregate data would have a common time frame.

The nature of the data gathered fell into three main categories. The first category was data collected on the costs of one particular availability by one particular IMA. These were the data of one hundred and fifty-one rows briefly described in the previous section. The second category was total ROV cost data for a particular IMA during a particular quarter of a fiscal year. The data from these two main data categories were put into two separate data files. The one containing data on the individual customer ship availabilities was named Data File ONE and the aggregate IMA data file was named Data File TWO. The third category was the information obtained from written and oral questions asked of those people involved with the cost estimation problem. This information is included in the text of this thesis.

Data Files ONE and TWO were numerically coded for analysis. The MINITAB program used for the analysis does not allow blank spaces in rows of data. For this reason, zeros were added as fillers in Data File TWO where data were not available. TABLE 2 lists the description and coding for the data gathered for Data File ONE. Appendix F contains Data File ONE. TABLE 3 lists the description and coding for Data File TWO. Appendix G contains Data File TWO.

TABLE 2

DATA FILE ONE COLUMN DESCRIPTION AND CODING

COLUMN	DESCRIPTION OF DATA	CODES USED
1	Fiscal Year and Quarter (example 84-2).	FY 84-2 = 1
		84-3 = 2
		84-4 = 3
		85-1 = 4
		85-2 = 5
		85-3 = 6
		85-4 = 7
		86-1 = 8
		86-2 = 9
		86-3 = 10
2	IMA that did the repairs	CAPE COD(AD-43)=43
		PRAIRIE(AD-15)=15
		AJAX(AR-6)=6
		HECTOR(AR-7)=7
		JASON(AR-8)=8

3	Deployment status of IMA	Not Deployed = 0 Deployed = 1
4	Homeport of IMA	San Francisco = 1 San Diego = 2 Long Beach = 3
5	Type of repair availability	Alongside = 1 Ship-to-Shop = 2
6	Type of ship repaired	CGN = 1 AE = 2 AOR = 3 DD= 4&20 LPH = 5 AD = 6 CVN = 7 LSD = 8 STEAM DDG = 9 FF = 10 LST = 11 LHA = 12 LPD = 13 MSO = 14 AFS = 15 FFG-7 CLASS = 16 BB = 17 CG = 19 AVM = 21 FFG-1 CLASS=22 GAS TURBINE DDG = 23 ARS = 24 LKA = 25 AOE = 26
7	Hull number of ship being repaired	SHIP'S HULL NUMBER
8	Number of work days scheduled for repair	NUMBER OF DAYS
9	Estimated ROV costs	COSTS IN DOLLARS

	Direct + Indirect + TAV)	
10	Obligations for ROV material used in in repairing the customer ship as reported in the SUADPS reports Seven and Eight	COSTS IN DOLLARS

TABLE 3

DATA FILE TWO COLUMN DESCRIPTION AND CODING

COLUMN	DESCRIPTION OF DATA	CODES USED
1	Fiscal Year and Quarter (example 84-2).	FY 84-2 = 1
		84-3 = 2
		84-4 = 3
		85-1 = 4
		85-2 = 5
		85-3 = 6
		85-4 = 7
		86-1 = 8
		86-2 = 9
		86-3 = 10
2	IMA that did the repairs	SIMA SAN FRANCISCO = 1
		SIMA LONG BEACH = 2
		SAMUEL GOMPERS(AD-37)=3
		PRAIRIE(AD-15) = 4
		AJAX(AR-6)= 5
		CAPE COD(AD-43) = 6
		ACADIA(AD-42) = 7
		HECTOR(AR-7) = 8
		JASON(AR-8) = 9
3	Deployment status of IMA	Not Deployed = 0
		Deployed = 1
4	Homeport of IMA	San Francisco = 1
		San Diego = 2

		Long Beach = 3
5	Type of repair availability	Alongside = 1 Ship-to-Shop = 2
6	Column 4 + Column 5 = Total ROV days assigned to the IMA for a particular customer's repairs.	NUMBER OF DAYS
7	Estimated total ROV costs (Ship-toShop + Alongside)	COST IN DOLLARS
8	Costs reported by message to COMNAVSURFPAC monthy by IMA's as actual ROV costs (obligations).	COSTS IN DOLLARS
9	SUADPS reports Seven and Eight total IMA ROV obligations	COSTS IN DOLLARS
10	Total est ROV costs (ROV + TAV + ROVI)	COSTS IN DOLLARS

D. DATA FILES TWO-ONE AND TWO-TWO

While preparing the data for analysis, it became apparent that three sub files of Data File TWO would be needed to complete the statistical analysis. This was apparent because some data points for Data File TWO were missing. Sub files which delete the rows with missing datum points would enable analysis of the columns that had missing rows of data. Data File TWO-ONE was created from Data File TWO by using the rows of Data File TWO that had values for SUADPS Reports Seven and Eight total ROV obligations (Column

Nine of Data File TWO). Data File TWO-ONE contained six rows, each consisting of ten columns of data points. Data File TWO-ONE is contained in Appendix H.

Data File TWO-TWO was created from Data File TWO by using the rows of Data File TWO which had data points for total estimated ROV costs: ROV Direct + TAV + ROVI (Column Ten of Data File TWO). Data File TWO-TWO is listed in Appendix I.

V. DATA ANALYSIS

A. INTRODUCTION

This chapter explains the method of data analysis, results of the analysis, and interpretation of the results. The regression equation used in the MINITAB program for analyzing the data was identical for each data file and is discussed first. The method of analysis, results of the analysis, and the interpretation of those results are explained separately for each data file. Also, the creation of a sub-file from Data File ONE which resulted from the process of analyzing the data is discussed.

B. THE REGRESSION EQUATION

Linear regression was used to determine if a relationship existed in the data which would enable prediction of ROV obligations. The regression model used was:

$$Y = B + M_1X_1 + M_2X_2 + E ,$$

where

B is the intercept (the predicted value of Y when $X = 0$),

Y is the dependent variable,

X_1 and X_2 are independent variables,

M_n is the slope, and

E is an error value.

In this model, X_1 represents the number of days a ship was scheduled for an availability, X_2 represents estimated ROV costs, and M is a measure of the relationship between X and Y. B represents the fixed cost associated with an IMA conducting repairs on a customer ship. For each data file, the dependent variable was regressed using one or two independent variables as the predictors.

C. METHOD OF ANALYSIS FOR DATA FILE ONE

Data File ONE was entered into the MINITAB program as a data file consisting of one hundred and fifty-one rows and ten columns of data. The number of observations in the sample (n) is 151. In the first regression run with this data, the number of days a customer ship was scheduled for an availability (Column Eight) was used as the independent variable, X_1, and the ROV SUADPS reported obligations for that customer ship's availability (Column Ten) was used as Y, the dependent variable. The second regression that was run using Data File ONE had the same dependent variable as described above (ROV SUADPS reported obligations) but the independent variable was changed to be the estimated ROV costs: Direct + Indirect + TAV (Column Nine). The last regression run using the data in Data File One as aggregate data was a multiple regression. In the multiple regression, the dependent variable was again SUADPS reported obligations (Column Ten). The two independent variables were the number of work days the customer ship was scheduled for an availability (Column Eight) as X_1, and the estimated ROV costs (Column Nine) as X_2. The results of the regressions are shown in TABLE 4.

TABLE 4

RESULTS OF LINEAR REGRESSION OF DATA FILE ONE

Dependent Variable	Independent Variable	R-Squared	F-Ratio
SUADPS Obligation	Availability Work Days	0.00	.057
SUADPS Obligation	Estimated ROV Costs	0.01	1.49
SUADPS Obligation	Availability Work Days & Estimated ROV Costs	0.01	0.75

The very small R-Squared and the F-Ratio both indicated the regressions run were not significant. The F distibution value of alpha used to test the significance of the F-Ratios was 0.05.

The regression results also listed two data elements within Data File ONE which had values that gave them large standard residuals (greater than three standard residuals). TABLE 5 lists the large standard residual datum points which were printed out when the Data File ONE regressions were run.

TABLE 5

DATA FILE ONE UNUSUAL OBSERVATIONS

Obs	c9	c10	Fit	Stdev Fit	Resid	St.Resid
34	14400	4971916	137920	59311	4833995	8.28R
101	10800	5171907	145385	63118	5026522	8.61R

The R designation of the Standard Residual is the MINITAB designation for an observation that has a large error factor associated with observation as compared to the other observations in the sample. Large is defined in the MINITAB program as a standard residual greater than 1.92.

Both of the datum points with large standard residuals had something in common: they were data from the USS PRAIRIE (AD-15). The large standard residual elements were ROV (TAV) obligations which USS PRAIRIE had charged to her UIC for self-repairs. This information suggested creating a data file which deleted the USS PRAIRIE ROV (TAV) data points. The sub file without five USS PRAIRIE self-availability (TAV) rows of data is named Data File ONE-ONE. Appendix H lists Data File ONE-ONE.

The same variables and procedures of analysis were used for analyzing Data File ONE-ONE as were used for Data File ONE. TABLE 6 is a summary of the results of the two regressions using Data File ONE-ONE. Both Data Files ONE and ONE-ONE were regressed as aggregates without regard to the different customer ship types.

TABLE 6

RESULTS OF REGRESSION OF DATA FILE ONE-ONE

Dependent Variable	Independent Variable	R-Squared	F-Ratio
SUADPS Obligation	Availability Work Days	0.014	1.98
SUADPS Obligation	Estimated ROV Costs	0.045	6.75*
SUADPS Obligation	Availability Work Days & Estimated ROV Costs	0.15	5.36*

*significant at alpha = 0.05.

The low R-Squared value and F-Ratio value of 1.98 for the first regression in TABLE 6 indicate the corresponding independent variable was not significant in explaining the dependent variable. In the other two regressions summarized in TABLE 6, the F-ratios were significant at alpha = 0.05 but the R-Squared values indicated large unexplained error terms Because of the large error variance, the corresponding regression equations cannot be used to predict ROV costs with greater than eighty percent accuracy. The next step in analyzing the information in Data File ONE was to determine if the data for each customer ship type (e.g., DD, FF, DDG, AE,) suggested a relationship between the SUADPS reported obligations and work days of the availability. To do this, SUADPS reported obligations (Column Ten) were used as the dependent variables- and the work days of the availability (Column Eight) were used as the independent variables. Each different ship type that was repaired was used as a dummy variable in the regression equation to categorize the regression by ship type repaired. A summary of the results of the regressions run are listed in TABLE 7.

TABLE 7

RESULTS OF REGRESSION BY SHIP TYPE OF DATA FILE ONE-ONE

Ship Type	Dependent Variable	Independent Variable	R-Squared	F-Ratio	N
CGN	SUADPS Oblig	Avail Work Days	0.163	1.7	11
AE	SUADPS Oblig	Avail Work Days	0.006	.041	9
AOR	SUADPS Oblig	Avail Work Days	0.072	.622	9
DD	SUADPS Oblig	Avail Work Days	0.011	.143	16
FF	SUADPS Oblig	Avail Work Days	0.011	.170	17
LST	SUADPS Oblig	Avail Work Days	0.184	.676	5
FFG-7 CLASS	SUADPS Oblig	Avail Work Days	0.023	.494	22
AVM	SUADPS	Avail	0.21	.532	4

	Oblig	Work Days			
CG	SUADPS Oblig	Avail Work Days	0.067	.355	5
STEAM DDG	SUADPS Oblig	Avail Work Days	0.183	1.79	9

The low R-Squared and F-Ratios indicated the regressions of data in Data File ONE-ONE are not useful in building a model to predict ROV costs. The small sample size for some of the relationships render the results of the regression questionable. However, the results for the three largest subsamples (i.e., DD, FF, and FFG-7) are consistent among themselves and with the other regressions.

D. INTERPRETATION OF RESULTS OF ANALYSIS OF DATA FILE ONE

The results of the regressions indicated that there is not a relationship between the number of days of an availability and the ROV obligations which could be used for improving the estimating of ROV costs. In addition, there are no apparent patterns that would suggest additional statistical analysis of the data.

E. METHOD OF ANALYSIS OF DATA FILE TWO

The purpose of this section of is to discuss the method of analysis used to determine if a relationship existed between the aggregate ROV costs and the availability days which could be used to estimate ROV costs. Linear regression was again the method used for analysis. Four different regressions were run using Data File TWO. The Ship-to-Shop Availability Days (Column Four), the Alongside Availability Days (Column Five), the Total Ship-to-Shop and Alongside Availability Days (Column Six: sum of Columns Four and Five), and Estimated Repair Costs: Ship-to-Shop + Alongside (Column Seven) data were used as the independent variable, X_1. ROV Obligations Reported by Monthly Message to COMNAVSURFPAC (Column Eight) data were used as the dependent variable, Y. The sample size, n, for DATA FILE TWO is sixteen. The independent variables were regressed to determine if a usable linear relationship existed with the dependent variables. The results of the regressions using Data File TWO are contained in TABLE 8.

TABLE 8

RESULTS OF LINEAR REGRESSION OF DATA FILE TWO

Dependent Variable	Independent Variable	R-Squared	F-Ratio
ROV OBLIGATIONS REPORTED BY MSG	# SHIP-TO-SHOP DAYS	0.176	2.98
ROV OBLIGATIONS REPORTED BY MSG	# ALONG-SIDE DAYS	0.022	.314
ROV OBLIGATIONS REPORTED BY MSG	SHIP-TO-SHOP + ALONGSIDE DAYS	0.177	3.02
ROV OBLIGATIONS	ESTIMATED	0.051	.615

REPORTED BY MSG	REPAIR COSTS: STS + ALONGSIDE

The R-Squared and F-ratio values in TABLE 8 indicated that aggregate cost information does not provide a useful model for predicting ROV costs.

F. METHOD OF ANALYSIS OF DATA FILE TWO-ONE

All of the rows of data in Data File TWO did not have all ten columns complete due to unavailable information. Therefore, Data File TWO-ONE and Data File TWO-TWO were created. The creation of Data File TWO-ONE provided a data file which enabled the researcher to determine what type of relationship existed between Costs Reported by Message to COMNAVSURFPAC as Actual ROV Costs (Column Eight) and SUADPS Reports Seven and Eight Total ROV Obligations (Column Nine). The type of relationship would indicate how close the two reported obligation totals were. Although this information would not help to build a model for predicting ROV costs, the author decided to do the analysis to determine if there was a significant difference in SUADPS and message reporting systems. ROV Costs Reported by Message to COMNAVSURFPAC (Column Eight) was used as the dependent variable (Y) and SUADPS Reports Seven and Eight Total ROV Obligations (Column Nine) was used as the independent variable (X_1). The results of the regressions using DATA FILE TWO-ONE are contained in TABLE 9.

TABLE 9

RESULTS OF LINEAR REGRESSION OF DATA FILE TWO-ONE

Dependent Variable	Independent Variable	R-Squared	F-Ratio
ROV OBLIGATIONS REPORTED BY MSG	SUADPS 7 & 8 ROV OBLIGATIONS	0.743	11.6*

*significant at alpha = 0.05.

The results of the Data File TWO-ONE regression indicated that approximately seventy-four percent of ROV Obligations reported by message can be explained by the SUADPS Reports Seven and Eight ROV Obligations. The F-Ratio for the regression is significant at alpha = 0.05.

G. METHOD OF ANALYSIS OF DATA FILE TWO-TWO

Creation of Data File TWO-TWO enabled the analysis of the relationship between Total Estimated ROV Costs: ROV Direct + ROV Indirect + TAV (Column Ten) and two variables: Costs Reported by Message to COMNAVSURFPAC as Actual ROV Costs (Column Eight) and SUADPS Reports Seven and Eight Total ROV Obligations (Column Nine).

Costs Reported by Monthly Message to COMNAVSURFPAC (Column Eight) and Total Estimated ROV Costs: ROV + TAV + ROVI (Column Ten) were used as independent variables (X_1 and X_2), and SUADPS total ROV Obligations (Column Nine) data was used as the dependent variables (Y), for regressions of Data File TWO-TWO.

Data File TWO-TWO data was used to determine if there was a usable relationship between the independent variable, X_1, ROV Costs Reported to COMNAVSURFPAC by Monthly Message (Column Eight) and the dependent variable, Y, Total Estimated ROV costs (Column Ten). The results of the regressions using Data File TWO-TWO are contained in TABLE 10.

TABLE 10

RESULTS OF LINEAR REGRESSION OF DATA FILE TWO-TWO

Dependent Variable	Independent Variable	R-Squared	F-Ratio
SUADPS 7 & 8 ROV OBLIGATIONS	TOTAL EST. ROV COSTS: DIRECT + INDIRECT + TAV	0.234	1.22
ROV OBLIGATIONS REPORTED BY MSG	TOTAL EST. ROV COSTS DIRECT + INDIRECT + TAV	0.004	.057

The R-Squared and F-Ratio values contained in TABLE 10 indicate that the regression equations tested do not provide models that can be used to predict ROV costs.

H. INTERPRETATION OF RESULTS OF ANALYSIS OF DATA FILE TWO

The results of the regressions of aggregate costs contained in Data File TWO revealed no relationships between dependent and independent variables that could be used to estimated ROV costs with eighty percent or greater accuracy.

VI. DISCUSSION AND CONCLUSIONS

A. DISCUSSION

The purpose of this chapter is to describe the conclusions developed through analysis of the data collected from interviews and historical files. Data from interviews provided background information, key personnel expectations of what the ROV cost estimation system is supposed to do, and the different methods of estimating ROV costs at different IMA'S. Archival data collected from COMNAVSURFPAC and FADDCPAC were entered into a computer and formed two basic data bases. Analysis of the data bases provided the information necessary to determine if a model to predict ROV costs with an eighty percent or greater accuracy could be derived from the data.

The four basic conclusions resulting from the data analysis discussed in this chapter are:

1. A model was not found based on the data available which IMA's could use to estimate ROV costs with eighty percent or greater accuracy.

2. There are different reporting criteria and there is no apparent consistency between the annual method of requesting ROV funds and the quarterly method of allocating ROV funds to the IMA's requesting those funds.

3. Obligations for customer ships reported by IMA's in SUADPS Reports Seven and Eight do not accurately reflect the total ROV money obligated for any individual customer ship's repairs and

therefore cannot be used as an independent source of obligation data.

4. Method of estimating and level of accuracy of cost estimates differ among IMA'S.

B. CONCLUSION 1: NO MODEL FOR ESTIMATING ROV COSTS

Archival data were used in an attempt to find a relationship between one or more independent variables and the dependent variable of obligations for ROV costs associated with individual ship repair availabilities and aggregate ROV costs for each IMA and for each type of ship repaired. The linear models resulting from regression analysis of the ROV data could not be used to estimate ROV costs with eighty percent accuracy. ROV costs and cost estimates were analyzed from two different overall viewpoints. The first viewpoint considered each customer ship's repairs individually and the second considered the quarterly aggregate ROV cost incurred by each IMA. The data analysis revealed no usable relationship between ROV costs and the independent variables used to attempt to predict those costs: days of customer ship repair availability, type of customer ship repaired, or estimated ROV costs for a customer ship.

C. CONCLUSION 2: REPORTING REQUIREMENTS DIFFER

The archival data collected for the study and the COMNAVSURFPAC and CINCPACFLT instructions regarding ROV costs, indicate:

1. Two reports currently submitted by IMA's

contain much of the same information.

2. Uses and formats of the ROV cost reports differed at each level of the chain of command from the IMA to NAVCOMPT. IMA's submit two different reports to two different offices within the COMNAVSURFPAC organization each month. The information in the report submitted to the Comptroller's office by message is a subset of the information contained in SUADPS Reports Seven and Eight which are submitted to another COMNAVSURFPAC office each month.

CINCPACFLT requires annual ROV estimates in terms of IMA man days from COMNAVSURFPAC as part of COMNAVSURFPAC's annual budget request. As a result of the CINCPACFLT requirement to be provided man day information, COMNAVSURFPAC requires the IMA's to submit monthly and annual IMA man day requirements. As a result of the ROV budget request from CINCPACFLT, CNO issues authority for CINCPACFLT to obligate ROV funds. CINCPACFLT then uses the authority to grant COMNAVSURFPAC an annual ROV budget based on the ROV man day requirement of COMNAVSURFPAC. COMNAVSURFPAC then issues OPTAR's to the IMA's based on the IMA's quarterly estimate of ROV costs which is submitted to COMNAVSURFPAC's Comptroller. An identifiable relationship between the original man day request for funds which the IMA's submitted and the quarterly ROV funds granted to the IMA's by COMNAVSURFPAC could not be found. Thus, there is no reason to expect a relationship between the original basis for requesting ROV funds and the subsequent allocation of ROV funds by COMNAVSURFPAC.

D. CONCLUSION 3: COSTS ACCOUNTED FOR BY CUSTOMER SHIP UIC

IMA Supply and Repair Officers pointed out that costs charged to a customer ship's UIC do not necessarily reflect all ROV money spent by the IMA to repair the customer ship. ROV obligations charged to a customer ship's UIC reported by IMA's in SUADPS Reports Seven and Eight imply that the total Direct ROV costs are accounted for in that UIC account. Actually, the amount of actual Direct ROV obligations for a particular UIC's availability cannot be easily traced due to the segmentation required in the accounting system to account for each type of fund or account. According to IMA Repair, Supply, and Assistant Supply Officers, not all Direct ROV costs for a particular availability are charged to the customer ship's UIC. Some of the costs are charged to ROV Indirect and some to TAV funds. This does not pose a problem as long as those using the SUADPS data understand that the costs charged to the customer ship's UIC are only a portion of the actual ROV obligations for the availability.

E. CONCLUSION 4: METHOD OF ESTIMATION AND LEVEL OF ACCURACY OF COST ESTIMATES

Interviews with IMA Supply Officers and members of the COMNAVSURFPAC staff as well as COMNAVSURFPAC and CINCPACFLT instructions, indicate that the current level of accuracy of ROV estimates required and the method of estimating ROV costs are to be determined by each individual IMA. Lacking guidance, each IMA has developed its own method of estimating ROV costs and its own level of accuracy (e.g., nearest dollar, ten dollars, hundred dollars, or thousand dollars). Although differences in estimation systems exist, none of the IMAs' systems can estimate actual ROV costs with the eighty percent or better accuracy desired by COMNAVSURFPAC.

VII. RECOMMENDATIONS

A. SUMMARY OF RECOMMENDATIONS

This section presents recommendations resulting from the conclusions described in the preceding chapter. The following is a summary of recommendations for improving COMNAVSURFPAC's ROV cost estimation and reporting systems which are explained in detail in this chapter:

1. COMNAVSURFPAC should promulgate the degree of accuracy (e.g. nearest hundred or thousand dollars) required for IMA estimates of ROV costs.

2. COMNAVSURFPAC should ensure all levels of the IMA chain of command understand that obligations reported for customer ships UIC'S in SUADPS Reports Seven and Eight are not comprehensive reports of total ROV obligations established for each UIC's repairs.

3. COMNAVSURFPAC review uses of IMA ROV quarterly estimate message report submitted to the COMNAVSURFPAC Comptroller with the intention of eliminating the report.

B. PROMULGATE ACCURACY NEEDED FOR ESTIMATES

Presently, each IMA uses its own ROV cost estimation system as discussed in Chapter II Section E of this thesis. If estimates are required, COMNAVSURFPAC should promulgate the accuracy they need for each estimate. As in most cases, the greater the accuracy desired, the greater the cost of collecting the data and preparing the estimates. The author did not find evidence to indicate that greater accuracy in ROV estimates is required. Rather, the evidence indicates that the ROV estimates should be eliminated as discussed in Section D, below.

C. SUADPS REPORTS SEVEN AND EIGHT

The information contained in the SUADPS Reports Seven and Eight appears to be sufficiently accurate for the present uses made of the reports. COMNAVSURFPAC should ensure that users of the SUADPS Reports Seven and Eight information are trained to understand that the information contained in the SUADPS reports are only a partial accounts of what was obligated for a particular UIC's repairs.

D. ELIMINATE ROV ESTIMATE REPORT

COMNAVSURFPAC should eliminate the Quarterly ROV estimate message report submitted by IMA's to COMNAVSURFPAC. The quarterly ROV estimate report should be eliminated because the information contained in the report does not have a consistent relationship to actual ROV costs. The basis used to originally request ROV funds (man hour reports) is the basis that should be used to allocate ROV funds.

E. RECOMMENDATIONS FOR FURTHER THESIS RESEARCH

Three areas of potential thesis research identified during the course of this study are discussed in this section. First, the information provided by the SUADPS system should be evaluated. Second, the NAVCOMPT Form 2199, Trial Balance Report prepared by FAADCPAC should be closely analyzed to isolate recurring differences between those reported by the AAA and those reported by the individual IMA's. Third, the necessity of submitting monthly IMA man hour estimates should be evaluated.

The amount and uses of the information provided by the SUADPS system should be evaluated. The research conducted for this thesis indicated that there are differing opinions of why ROV cost estimation is needed and what level of accuracy is needed. It appears that users of reports have not weighed the cost of providing information against the benefits gained by having the information. A study should be undertaken on the information provided by the SUADPS reporting system. The study should evaluate the level of accuracy required and compare the cost of providing the required information to the benefits gained from the actual uses of the information.

The NAVCOMPT Form 2199, Trial Balance Report prepared by FAADCPAC should be closely analyzed to isolate recurring differences between those reported by the AAA and those unofficially reported by the individual IMA's in message and SUADPS reports. Analysis of those differences in reported obligations and expenditures may help in developing better estimating and reporting methods to be used by IMA's. Additionally, since the data reported by FAADCPAC consistently differs from the SUADPS reported obligation data, it should be determined if the differences are sufficient to warrant COMNAVSURFPAC adjustment of IMA reported ROV obligation data. The issue is important because the obligation data reported to COMNAVSURFPAC by IMA's is used as the basis for quarterly allocation of ROV funds to the IMA's.

The necessity of submitting monthly IMA man hour estimates should be evaluated. The IMA's go through a considerable amount of work to prepare estimates not only for ROV costs but also for the man hour requirements for each job, each month. The uses and cost of providing the information should be reviewed with a goal of eliminating unnecessary reporting requirements. Close coordination with NAVCOMPT officials could provide the guidance necessary to determine the level of record keeping and reporting required. It could be beneficial for a thesis student to study the man hour and ROV estimation reports required of IMA's, what the report information is used for, and the reason for each report. The research topic could be: Can IMA reports to higher authority be reduced without loss of fiscal control by higher authority?

APPENDIX A

QUESTIONS ASKED OF IMA SUPPLY OFFICERS

1. Explain the process of how an estimate for Repair of Other Vessel costs for a ship that will be repaired is accomplished from submission to COMNAVSURFPAC back to the start of the process.

2. What is included in the ROV cost estimate for each availability (e.g. parts, services from outside activities, shop overhead, and direct labor)?

3. How are the ROV obligations reported to COMNAVSURFPAC computed for a certain period?

4. Is there any documentation available which compares estimates and actual obligation of ROV funds for each availability?

5. Who screens Current Ship's Maintenance Program (CSMP)/Work Requests and do they use any financial criteria for acceptance or rejection?

APPENDIX B

ARCHIVAL DATA GATHERED

FY QTR	IMA	DEPLY	HOME PORT	TYPE AVAL	SHIP TYPE	HULL #	REPAIR DAYS	EST. COST	SUADPS OBLIG
84-2	SIMASF	H	SFRAN	A	CGN	36	91	72800	
84-2	SIMASF	H	SFRAN	A	CGN	36	26	20800	
84-2	SIMASF	H	SFRAN	STS	CGN	36	13	10400	
84-2	SIMASF	H	SFRAN	STS	CGN	36	24	19200	
84-2	SIMASF	H	SFRAN	STS	AE	32	18	14400	
84-2	SIMASF	H	SFRAN	STS	AOR	3	89	71200	
84-2	SIMASF	H	SFRAN	STS	AE	35	26	20800	
84-2	SIMASF	H	SFRAN	STS	AE	29	41	32800	
84-2	SIMASF	H	SFRAN	STS	AE	24	25	20000	
84-2	SIMASF	H	SFRAN	STS	AOR	7	19	15200	
84-2	SIMASF	H	SFRAN	STS	AE	33	91	72800	
84-2	AD-37	H	SDGO	A	DD	975	13	35152	
84-2	AD-37	H	SDGO	A	LPH	3	6	16224	
84-2	AD-37	H	SDGO	A	AD	37	12	32448	
84-2	AD-37	H	SDGO	A	CVN	65	19	51376	
84-2	AD-37	H	SDGO	A	CVN	70	19	51376	
84-2	AD-37	H	SDGO	A	CGN	36	19	51376	
84-2	AD-37	H	SDGO	A	CGN	41	12	32448	
84-2	AD-37	H	SDGO	A	AD	37	11	29744	
84-2	AD-37	H	SDGO	STS	LSD	35	13	25142	
84-2	AD-37	H	SDGO	STS	DDG	15	13	25142	
84-2	AD-37	H	SDGO	STS	FF	1065	13	25142	
84-2	AD-37	H	SDGO	STS	LST	1198	13	25142	
84-2	AD-37	H	SDGO	STS	LHA	3	13	25142	
84-2	AD-37	H	SDGO	STS	CGN	35	12	23208	
84-2	AD-37	H	SDGO	STS	CGN	25	12	23208	
84-2	AD-37	H	SDGO	STS	AOR	3	18	34812	
84-2	AD-37	H	SDGO	STS	AOR	7	18	34812	
84-2	AD-37	H	SDGO	STS	AE	35	18	34812	
84-2	AD-15	D	SDGO	A	DD	975	5	4000	
84-2	AD-15	D	SDGO	A	FF	1052	5	4000	
84-2	AD-15	D	SDGO	A	FF	1064	5	4000	
84-2	AD-15	D	SDGO	A	FF	1067	5	4000	
84-2	AD-15	D	SDGO	A	FF	1087	4	4000	
84-2	AR-6	H	SDGO	A	AE	29	10	20000	
84-2	AR-6	H	SDGO	A	LST	1195	15	30000	
84-2	AD-43	H	SDGO	A	CGN	39	27	168000	
84-2	AD-43	H	SDGO	A	LPD	9	12	60000	
84-2	AD-43	H	SDGO	A	LST	1187	12	60000	
84-2	AD-43	H	SDGO	A	DDG	12	9	60000	
84-2	AD-43	H	SDGO	STS	DD	991	17	48000	
84-2	AD-43	H	SDGO	STS	MSO	464	9	30000	
84-3	SIMASF	H	SFRAN	STS	CGN	41	19	15200	
84-3	SIMASF	H	SFRAN	STS	CGN	36	40	32000	
84-3	SIMASF	H	SFRAN	STS	AE	32	51	40800	
84-3	SIMASF	H	SFRAN	STS	AOR	3	48	38400	
84-3	SIMASF	H	SFRAN	STS	AE	35	18	14400	
84-3	SIMASF	H	SFRAN	STS	AFS	1	26	20800	
84-3	SIMASF	H	SFRAN	STS	AE	24	47	37600	
84-3	SIMASF	H	SFRAN	STS	AOR	7	25	20000	
84-3	SIMASF	H	SFRAN	STS	AOR	1	76	60800	
84-3	AD-15	H	SDGO	A	AD	15	30	15000	
84-3	AR-6	H	SDGO	A	LPD	2	10	20000	
84-3	AR-6	H	SDGO	A	DD	973	5	10000	

84-3	AR-6	H	SDGO	A	LST	1189	15	30000	
84-3	AR-6	H	SDGO	A	LST	1187	10	20000	
84-3	AR-6	H	SDGO	A	LST	1189	10	20000	
84-3	AR-6	H	SDGO	A	FFG	30	10	20000	
84-3	AR-6	H	SDGO	A	LST	1185	10	20000	
84-3	AR-6	H	SDGO	A	LPD	10	10	20000	
84-3	AR-6	H	SDGO	A	LSD	39	10	20000	
84-3	AR-6	H	SDGO	A	CGN	39	10	20000	
84-3	AR-6	H	SDGO	STS	LST	1189	30	45000	
84-3	AR-6	H	SDGO	STS	DD	966	10	15000	
84-3	AD-43	H	SDGO	A	FF	1055	13	89600	
84-3	AD-43	H	SDGO	STS	MSO	488	8	14400	
84-3	AD-43	H	SDGO	STS	MSO	438	8	14400	
84-3	AD-43	H	SDGO	STS	CGN	BAIN	13	19200	
84-3	AD-43	H	SDGO	STS	HSO	437	13	19200	
84-3	AD-43	H	SDGO	STS	MSO	455	13	19200	
84-3	AD-43	H	SDGO	STS	HSO	492	13	19200	
84-3	AD-43	H	SDGO	STS	AOE	1	13	19200	
84-3	AD-43	H	SDGO	STS	CGN	35	13	19200	
84-3	AD-43	H	SDGO	STS	AOE	2	13	19200	
84-3	AD-43	H	SDGO	STS	AE	29	10	16000	
84-3	AD-43	H	SDGO	STS	CGN	36	13	20800	
84-3	AD-43	H	SDGO	STS	AE	35	14	22400	
84-3	AD-43	H	SDGO	STS	CGN	41	15	24000	
84-3	AD-43	H	SDGO	STS	MSO	439	15	24000	
84-3	AD-43	H	SDGO	STS	AE	32	15	24000	
84-3	AD-43	H	SDGO	STS	MSO	489	15	24000	
84-3	AD-43	H	SDGO	STS	AOR	3	15	24000	
84-3	AD-43	H	SDGO	STS	AE	24	15	24000	
84-3	AD-43	H	SDGO	STS	AOR	1	15	24000	
84-3	AD-43	H	SDGO	STS	DD	971	23	38400	
84-3	AD-43	H	SDGO	STS	DEG	1	30	46400	
84-4	AD-43	H	SDGO	A	LST	1195	21	163200	76988
84-4	AD-43	H	SDGO	A	CGN	39	17	138400	68375
84-4	AD-43	H	SDGO	A	FF	1070	9	57600	5328
84-4	AD-43	H	SDGO	A	CG	30	8	57600	10714
84-4	AD-43	H	SDGO	A	DDG	13	14	96000	
84-4	AD-43	H	SDGO	A	DD	992	9	64000	6707
84-4	AD-43	H	SDGO	A	FF	1055	9	64000	20436
84-4	SIHASF	H	SFRAN	STS	CGN	36	53	42400	
84-4	SIHASF	H	SFRAN	STS	AOR	3	19	15200	
84-4	SIHASF	H	SFRAN	STS	AE	25	92	73600	
84-4	SIHASF	H	SFRAN	STS	AE	35	19	15200	
84-4	SIMASF	H	SFRAN	STS	AFS	1	56	44800	
84-4	SIMASF	H	SFRAN	STS	AE	29	24	19200	
84-4	SIMASF	H	SFRAN	STS	AE	24	24	19200	
84-4	SIMASF	H	SFRAN	STS	AOR	7	30	24000	
84-4	SIMASF	H	SFRAN	STS	AOR	1	76	60800	
84-4	AD15	H	SDGO	A	DD	964	20	16000	5800
84-4	AD15	H	SDGO	A	LPD	5	14	26400	4878
84-4	AD15	H	SDGO	A	BB	62	68	68000	32700
84-4	AD15	H	SDGO	A	AD	15	15	11250	721185
84-4	AD15	H	SDGO	STS	LSD	36	24	19800	1025
84-4	AD15	H	SDGO	STS	DDG	13	33	27225	1789
84-4	AD15	H	SDGO	STS	FFG	33	9	6750	2318
84-4	AD15	H	SDGO	STS	FFG	41	68	51400	1950
84-4	AD15	H	SDGO	STS	DD	976	68	54400	3863
84-4	AD15	H	SDGO	STS	FF	1058	68	49300	1093
84-4	AD15	H	SDGO	STS	LHA	5	57	52725	8660
84-4	AD15	H	SDGO	STS	DEG	2	33	24750	145
84-4	AD15	H	SDGO	STS	FFG	46	23	17250	5923
84-4	AD15	H	SDGO	STS	FF	1066	24	17400	4484
84-4	AD15	H	SDGO	STS	FFG	43	8	6000	
84-4	AR6	H	SFRAN	A	CGN	36	9	18000	

84-4	AR6	H	SFRAN	STS	AE	25	55	82500	5106
84-4	AR6	H	SFRAN	STS	AE	35	15	22500	
84-4	AR6	H	SFRAN	STS	AOR	7	15	36000	9250
84-4	AR6	H	SFRAN	STS	AOR	1	55	82500	3637
84-4	AR6	H	SFRAN	STS	AFS	1	30	45000	138
84-4	AR6	H	SFRAN	STS	AOR	5	15	22500	12899
84-4	AR6	H	SFRAN	STS	AE	24	18	27000	413
84-4	AR6	H	SFRAN	STS	AE	22	15	22500	1543
84-4	AR6	H	SFRAN	STS	AOR	7	9	13500	
84-4	AR6	H	SFRAN	STS	AE	29	9	13500	7071
84-4	AR6	H	SFRAN	STS	AOR	3	9	13500	180
85-1	AD15	H	LB	A	LST	1186	15	10500	611
85-1	AD15	H	LB	A	BB	62	23	20700	35367
85-1	AD15	H	LB	A	LPD	5	10	7000	5323
85-1	AD15	H	LB	A	LHA	5	12	9600	24136
85-1	AD15	H	LB	A	AD	15	24	14400	4971916
85-1	AD15	H	LB	STS	FFG	38	9	6300	158
85-1	AD15	H	LB	STS	FFG	51	44	30800	1612
85-1	AD15	H	LB	STS	FF	1066	63	12600	5974
85-1	AD15	H	LB	STS	FFG	41	63	44100	3079
85-1	AD15	H	LB	STS	DD	976	14	11200	10853
85-1	AD15	H	LB	STS	FF	1058	53	10600	5042
85-1	AD15	H	LB	STS	AVM	1	63	44100	33914
85-1	AD15	H	LB	STS	FFG	46	44	30800	2547
85-1	AD15	H	LB	STS	FFG	43	63	44100	226
85-1	AD15	H	LB	STS	FFG	9	19	13300	18814
85-1	AD15	H	LB	STS	AOR	5	38	22800	840
85-1	AR6	H	SD	A	DEG	1	14	29400	4035
85-1	AR6	H	SD	A	CGN	35	10	21000	1543
85-1	AR6	H	SD	A	DE	1050	15	31500	475
85-1	SSF	H	SF	STS	CGN	36	12	9600	
85-1	SSF	H	SF	STS	AE	25	92	73600	
85-1	SSF	H	SF	S	AOR	3	36	28800	
85-1	SSF	H	SF	S	AFS	1	82	65600	
85-1	SSF	H	SF	S	AE	22	29	23200	
85-1	SSF	H	SF	S	AE	24	19	15200	
85-1	SSF	H	SF	S	AE	33	5	4000	
85-1	SSF	H	SF	S	ADR	1	12	9600	
85-1	AD43	H	SD	S	FF	1070	24	32240	5710
85-1	AD43	H	SD	S	CG	16	24	32240	8858
85-1	AD43	H	SD	S	DD	973	24	32240	13494
85-1	AD43	H	SD	S	CGN	39	24	32240	53053
85-1	AD43	H	SD	S	LPD	6	22	23560	9790
85-1	AD43	H	SD	S	LPD	10	22	23560	10205
85-1	AD43	H	SD	S	LSD	39	22	23560	9144
85-1	AD43	H	SD	S	LHA	1	22	23560	6134
85-1	AD43	H	SD	S	LST	1187	22	23560	9693
85-1	AD43	H	SD	S	DDG	14	22	24800	7844
85-1	AD43	H	SD	S	CG	21	22	24800	20880
85-1	AD43	H	SD	S	DD	966	22	24800	32453
85-1	AD43	H	SD	S	DD	990	22	24800	20434
85-1	AD43	H	SD	S	FFG	37	29	35960	1008
85-1	AD43	H	SD	S	DDG	994	44	52080	3626
85-1	AD43	H	SD	S	CG	33	44	52080	7373
85-1	AD43	H	SD	S	FF	1055	44	52080	10395
85-1	AD43	H	SD	S	FFG	19	44	52080	92870
85-1	AD43	H	SD	S	LHA	3	54	54560	2566
85-1	AD43	H	SD	S	DD	992	54	54560	7594
85-1	AD43	H	SD	S	CGN	9	54	54560	6946
85-1	AD43	H	SD	S	CGN	36	10	11160	3816
85-1	AD43	H	SD	S	AE	35	10	11160	525
85-1	AD43	H	SD	S	AE	29	10	11160	1711
85-1	AD43	H	SD	S	AOR	7	10	11160	
85-1	AD43	H	SD	S	AOR	3	27	31000	4029

85-1	AD43	H	SD	S	FF	1076	43	40920	8190
85-1	AD43	H	SD	S	DDG	7	21	12400	5973
85-2	SSF	H	SF	S	DE	1050	8	7200	
85-2	SSF	H	SF	S	CGN	41	19	17100	
85-2	SSF	H	SF	S	CGN	36	19	17100	
85-2	SSF	H	SF	S	AE	32	28	25200	
85-2	SSF	H	SF	S	AD	37	7	6300	
85-2	SSF	H	SF	S	AE	25	90	81000	
85-2	SSF	H	SF	S	AR	7	19	17100	
85-2	SSF	H	SF	S	AFS	1	34	30600	
85-2	SSF	H	SF	S	AE	22	58	52200	
85-2	SSF	H	SF	S	AE	24	19	17100	
85-2	SSF	H	SF	S	AOE	1	28	25200	
85-2	SSF	H	SF	S	AE	33	19	17100	
85-2	SSF	H	SF	S	AOR	1	19	17100	
85-2	AR6	H	SD	A	DE	1050	6	12000	37284
85-2	AR6	H	SD	A	CG	30	8	16000	13128
85-2	AR6	H	SD	A	LHA	3	15	45000	6528
85-2	AR6	H	SD	A	FF	1053	15	30000	11188
85-2	AR6	H	SD	A	LPD	7	15	30000	9349
85-2	AR6	H	SD	A	FFG	14	9	18000	190
85-2	AR6	H	SD	A	FFG	9	12	24000	2187
85-2	AR6	H	SD	A	FFG	38	10	20000	1334
85-2	AR6	H	SD	A	FF	1060	12	24000	277
85-2	AR6	H	SD	A	LPD	5	12	24000	
85-2	AR6	H	SD	A	LPD	9	10	20000	6740
85-2	AR6	H	SD	A	FFG	10	15	30000	
85-2	AD43	H	SD	A	DE	1051	7	14600	5268
85-2	AD43	H	SD	A	CGN	41	16	105500	43034
85-2	AD43	H	SD	A	FF	1065	9	37400	3318
85-2	AD43	H	SD	A	LPH	3	16	59200	2157
85-2	AD43	H	SD	A	DD	971	16	59200	868
85-2	AD43	H	SD	S	CGN	9	26	30000	3307
85-2	AD43	H	SD	S	MSO	464	53	11400	
85-2	AD43	H	SD	S	AE	25	16	19750	3029
85-2	AD43	H	SD	S	AE	22	16	19750	12703
85-2	AD43	H	SD	S	CGN	8AIN	22	26000	1659
85-2	AD15	H	LB	A	LSD	36	23	16100	15281
85-2	AD15	H	LB	A	LST	1195	23	16100	
85-2	AD15	H	LB	A	DD	964	23	18400	18862
85-2	AD15	H	LB	A	FFG	33	13	9100	6866
85-2	AD15	H	LB	A	88	62	24	19200	29007
85-2	AD15	H	LB	A	AVM	1	15	12000	35134
85-2	AD15	H	LB	A	LHA	5	4	3600	29176
85-2	AD15	H	LB	A	AD	15	18	10800	5171907
85-2	AD15	H	LB	S	FF	1086	6	4200	
85-2	AD15	H	LB	S	FFG	37	15	10500	97744
85-2	AD15	H	LB	S	DDG	20	11	7700	
85-2	AD15	H	LB	S	FFG	41	10	2000	7306
85-2	AD15	H	LB	S	FF	1077	11	7700	
85-2	AD15	H	LB	S	FF	1073	11	7700	445
85-2	AD15	H	LB	S	ARS	42	10	7700	285
85-2	AD15	H	LB	S	FFG	46	28	5600	643
85-2	AD15	H	LB	S	FF	1066	33	23100	22062
85-2	AD15	H	LB	S	DDG	22	11	7700	1399
85-2	AD15	H	LB	S	FFG	43	28	16800	
85-2	AD15	H	LB	S	AOR	5	33	19800	11711
85-2	AD15	H	LB	S	FFG	9	28	19600	
85-3	AD15	H	LB	A	FFG	38	16	12800	11219
85-3	AD15	H	LB	A	ARS	38	25	10000	9657
85-3	AD15	H	LB	A	AVM	1	15	12000	5075
85-3	AD15	H	LB	A	AD	15	40	28000	231075
85-3	AD15	H	LB	A	DD	964	17	13600	10639
85-3	AD15	H	LB	A	FFG	43	10	4000	

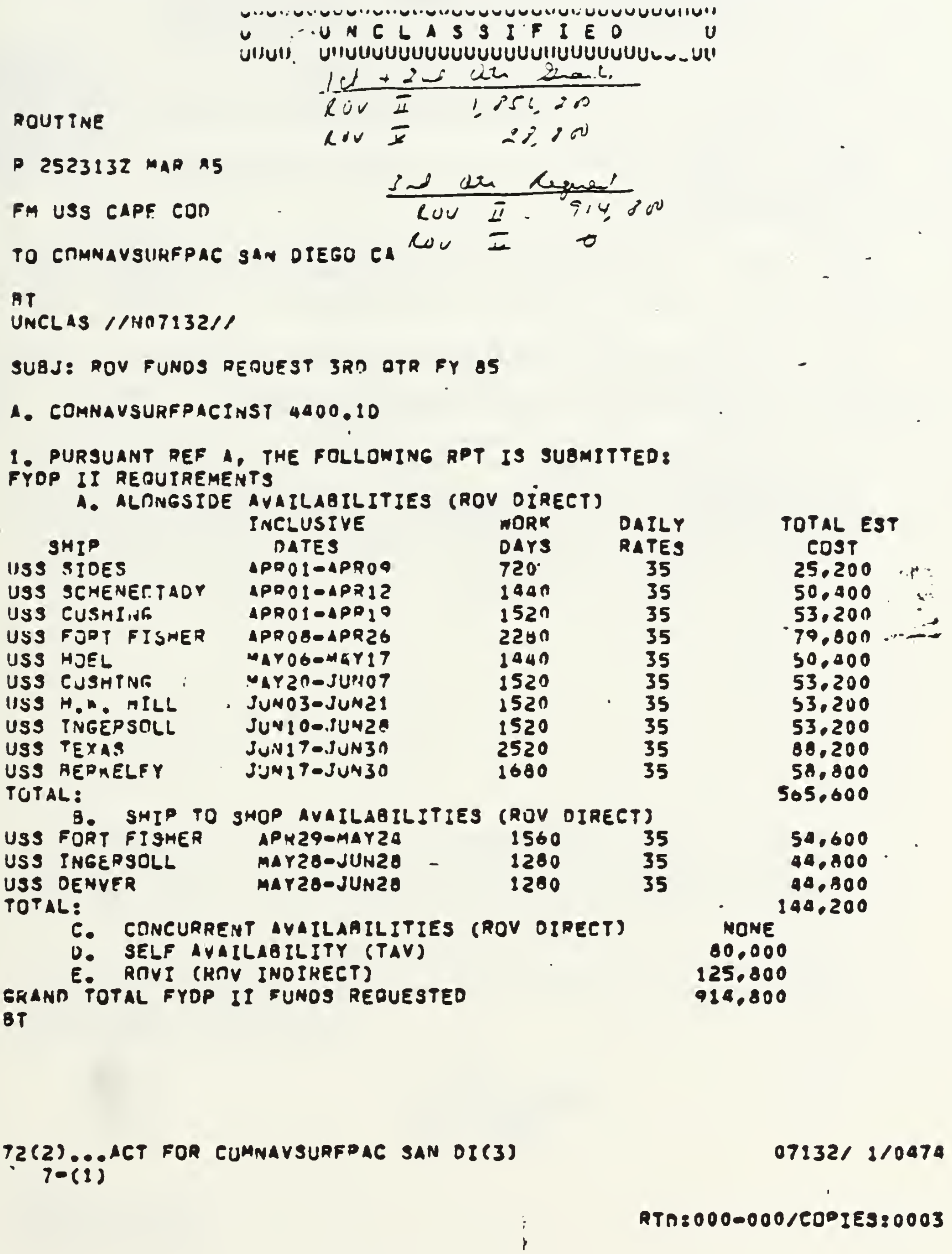
85-3	AR6	H	SD	A	LKA	114	12	36000	30144
85-3	AR6	H	SD	A	DDG	8	12	36000	23465
85-3	AD43	H	SD	A	FFG	14	7	25200	8503
85-3	AD43	H	SD	A	LST	1185	10	50400	13856
85-3	AD43	H	SD	A	DD	985	29	106400	22764
85-3	AD43	H	SD	A	LSD	40	14	134400	26959
85-3	AD43	H	SD	A	DDG	13	12	50400	9736
85-3	AD43	H	SD	A	DD	986	14	53200	8664
85-3	AD43	H	SD	A	DD	990	14	98000	8470
85-3	AD43	H	SD	A	CGN	39	11	88200	41826
85-3	AD43	H	SD	A	DDG	15	11	58800	3437
85-3	AD43	H	SD	S	LPD	9	22	44800	14045
85-3	SSF	H	SF	S	AE	32	47	37600	
85-3	SSF	H	SF	S	AD	37	75	60000	
85-3	SSF	H	SF	S	AE	25	30	24000	
85-3	SSF	H	SF	S	AOR	3	26	20800	
85-3	SSF	H	SF	S	AFS	1	21	16800	
85-3	SSF	H	SF	S	AE	22	19	15200	
85-3	SSF	H	SF	S	AE	24	24	19200	
85-3	SSF	H	SF	S	AOE	1	26	20800	
85-3	SSF	H	SF	S	AE	33	16	12800	
85-3	SSF	H	SF	S	AOR	1	19	15200	
85-3	AD37	H	SD	S	LPD	8	12	29280	4876
85-3	AD37	H	SD	S	FF	1076	19	46360	931
85-3	AD37	H	SD	S	AE	32	28	68320	
85-3	AD37	H	SD	S	CG	33	12	29280	55
85-3	AD37	H	SD	S	FF	1037	19	46360	2133
85-3	AD37	H	SD	S	AE	25	24	58560	692
85-3	AD37	H	SD	S	AGOS	2	19	46360	
85-3	AD37	H	SD	S	AOE	1	28	68320	58410
85-3	AD37	H	SD	S	AOR	1	19	46360	6231
85-4	SSF	H	SF	A	AD	37	78	62400	
85-4	SSF	H	SF	A	AE	29	71	56800	
85-4	SSF	H	SF	S	CGN	41	74	59000	
85-4	SSF	H	SF	S	AE	32	18	14400	
85-4	SSF	H	SF	S	AE	25	12	9600	
85-4	SSF	H	SF	S	AE	35	73	71200	
85-4	SSF	H	SF	S	DE	1051	9	7200	
85-4	SSF	H	SF	S	AE	24	16	12800	
85-4	AD43	H	SD	A	CGN	39	5	42000	142852
85-4	AD43	H	SD	A	DDG	15	5	42000	17867
85-4	AD43	H	SD	A	DE	1037	10	54600	5342
85-4	AD43	H	SD	A	DDG	7	10	54600	20926
85-4	AD43	H	SD	A	DD	971	15	79800	9457
85-4	AD43	H	SD	A	FF	1069	15	79800	22428
85-4	AD43	H	SD	A	LST	1185	20	109200	26395
85-4	AD43	H	SD	A	CGN	35	14	113400	34632
85-4	AD43	H	SD	A	CG	23	4	37800	21394
85-4	AD15	H	LB	A	AVM	1	17	13600	23671
85-4	AD15	H	LB	A	AD	15	20	14000	1038154
85-4	AD15	H	LB	A	88	62	14	11200	38261
85-4	AD15	H	LB	A	AOR	5	11	8800	23203
85-4	AD15	H	LB	A	FFG	37	12	6600	94278
85-4	AD15	H	LB	S	DDG	14	41	20500	8024
85-4	AD15	H	LB	S	LSD	39	36	21600	
85-4	AD15	H	LB	S	FFG	46	16	6400	445
85-4	AD15	H	LB	S	AOR	7	38	22800	14937
85-4	AD15	H	LB	S	FFG	48	38	15200	
85-4	AD15	H	LB	S	FFG	38	10	4000	109450
86-1	AR6	H	SD	A	DDG	13	9	18900	
86-1	AR6	H	SD	A	FF	1083	5	10500	
86-1	AR6	H	SD	A	FF	1071	5	10500	
86-1	AR6	H	SD	A	CG	33	8	16800	
86-1	AD43	H	SD	A	DE	1050	14	41230	

86-1	AD43	H	SD	A	FF	1065	9	25200
86-1	AD43	H	SD	A	DD	975	15	41230
86-1	AD43	H	SD	A	DDG	996	14	41230
86-1	AD43	H	SD	A	FF	1069	14	41230
86-1	AD43	H	SD	A	LSD	33	16	48090
86-1	AD43	H	SD	A	FF	1088	10	25200
86-1	AD43	H	SD	A	FFG	41	10	25200
86-1	AD43	H	SD	A	DD	975	10	25200
86-1	AD43	H	SD	A	FFG	23	10	25200
86-1	AD43	H	SD	S	LSD	33	22	50725
86-1	AD43	H	SD	S	DD	992	9	18000
86-1	AD43	H	SD	A	DD	971	9	25200
86-1	AD43	H	SD	A	FF	1069	9	25200
86-1	AD43	H	SD	A	DE	1050	9	25200
86-1	AD43	H	SD	A	DDG	7	9	25200
86-1	AD43	H	SD	A	FF	1055	15	79800
86-1	AD43	H	SD	A	DD	990	24	134400
86-1	AD43	H	SD	A	DD966		10	25200
86-1	AD43	H	SD	A	FF	1066	10	25200
86-1	AD43	H	SD	A	DD	976	20	109200
86-1	AD43	H	SD	A	FF	1088	14	79800
86-1	AD43	H	SD	A	CG	30	6	37800
86-1	AD43	H	SD	S	CGN	9	66	138000
86-1	AD43	H	SD	S	DD	966	20	18000
86-1	SSF	H	SF	A	LPD	6	92	73600
86-1	SSF	H	SF	A	AD	37	10	8000
86-1	SSF	H	SF	A	AE	22	40	32000
86-1	SSF	H	SF	A	AE	29	92	73600
86-1	SSF	H	SF	S	CGN	41	34	27200
86-1	SSF	H	SF	S	AE	32	16	12800
86-1	SSF	H	SF	S	AOR	3	19	15200
86-1	SSF	H	SF	S	AE	35	46	36800
86-1	AD15	H	LB	A	DD	964	15	12000
86-1	AD15	H	LB	A	FFG	38	9	6300
86-1	AD15	H	LB	A	AD	15	20	12000
86-1	AD15	H	LB	A	BB	62	20	16000
86-1	AD15	H	LB	S	LSD	39	66	33000
86-1	AD15	H	LB	S	AOR	7	24	12000
86-1	AD15	H	LB	S	FFG	48	44	17600
86-1	AD15	H	LB	S	DDG	14	66	33000
86-1	AD15	H	LB	S	FFG	54	20	8000
86-1	AD15	H	LB	S	FFG	51	15	6000
86-1	SLB	H	LB	A	FF	1054	34	86000
86-1	SLB	H	LB	A	FF	1060	23	47000
86-1	SLB	H	LB	A	FFG	10	92	184000
86-1	SLB	H	LB	A	FFG	9	21	42000
86-1	SLB	H	LB	A	LST	1191	29	43500
86-1	SLB	H	LB	A	ARS	38	26	13000
86-1	SLB	H	LB	A	LPD	5	54	54000
86-1	SLB	H	LB	A	FFG	12	39	78000
86-1	SLB	H	LB	A	LSD	36	54	108000
86-1	SLB	H	LB	A	DD	964	46	46000
86-1	SLB	H	LB	A	LKA	115	40	80000
86-1	SLB	H	LB	A	AOR	5	16	16000
86-1	SLB	H	LB	A	AOR	7	32	25600
86-1	SLB	H	LB	A	FFG	48	61	61000
86-1	SLB	H	LB	A	DDG	24	92	92000
86-1	SLB	H	LB	A	LSD	39	92	73600
86-1	SLB	H	LB	A	DDG	14	92	73600
86-1	SLB	H	LB	A	LST	1186	84	67200
86-1	SLB	H	LB	A	LHA	5	54	54000
86-2	AD37	H	SF	S	CGN	41	3	2850
86-2	AD37	H	SF	S	CGN	36	51	48450
86-2	AD37	H	SF	S	AE	25	12	11400
86-2	AD37	H	SF	S	AE	29	90	85500

86-2	AD37	H	SF	S	AE	22	22	20900
86-2	AD37	H	SF	S	AOR	3	78	74100
86-2	AD37	H	SF	S	AE	35	19	18050
86-2	AD37	H	SF	S	AFS	1	8	7600
86-2	AD37	H	SF	S	AE	24	29	27550
86-2	AD37	H	SF	S	AE	32	43	40850
86-2	AD37	H	SF	S	AE	33	8	7600
86-2	AD37	H	SF	S	AOE	1	11	10450
86-2	AD15	H	LB	A	FFG	38	10	6000
86-2	AD15	H	LB	A	FFG	33	15	9000
86-2	AD15	H	LB	A	DD	964	9	6300
86-2	AD15	H	LB	A	BB	62	11	8800
86-2	AD15	H	LB	A	AD	15	36	25200
86-2	AD15	H	LB	A	AOR	5	11	7700
86-2	AD15	H	LB	A	FFG	37	26	20800
86-2	AD15	H	LB	A	FFG	51	15	9000
86-2	AD15	H	LB	A	FFG	14	15	9000
86-2	AD15	H	LB	S	DDG	14	46	23000
86-2	AD15	H	LB	S	LSD	39	64	25600
86-2	AD15	H	LB	S	AOR	7	9	4500
86-2	SSF	H	SF	A	CGN	36	39	31200
86-2	SSF	H	SF	A	SE	32	43	34400
86-2	SSF	H	SF	A	AOR	3	78	62400
86-2	SSF	H	SF	A	AFS	1	8	6400
86-2	SSF	H	SF	A	AE	22	10	8000
86-2	SSF	H	SF	A	AE	29	90	72000
86-2	SSF	H	SF	A	AE	24	64	51200
86-2	SSF	H	SF	A	AE	33	8	6400
86-2	SSF	H	SF	A	AOR	1	11	8800
86-2	SSF	H	SF	S	CGN	41	14	11200
86-2	SSF	H	SF	S	CGN	36	15	12000
186-2	SSF	H	SF	S	AE	25	12	9600
86-2	SSF	H	SF	S	AE	35	15	12000
86-2	SSF	H	SF	S	AE	22	12	9600
86-2	AD43	H	SD	A	CG	30	13	71400
86-2	AD43	H	SD	A	FFG	41	8	42000
86-2	AD43	H	SD	A	DD	975	8	42000
86-2	AD43	H	SD	A	FFG	23	8	42000
86-2	AD43	H	SD	A	DEG	2	9	50400
86-2	SLB	H	LB	A	FF	1054	37	63000
86-2	SLB	H	LB	A	FF	1060	12	12000
86-2	SLB	H	LB	A	FFG	10	32	51000
86-2	SLB	H	LB	A	FFG	9	12	12000
86-2	SLB	H	LB	A	LST	1191	45	90000
86-2	SLB	H	LB	A	FFG	12	85	170000
86-2	SLB	H	LB	A	ARS	38	40	20000
86-2	SLB	H	LB	S	LPD	5	57	57000
86-2	SLB	H	LB	S	LSD	36	61	61000
86-2	SLB	H	LB	S	DD	964	19	19000
86-2	SLB	H	LB	S	LKA	115	10	10000
86-2	SLB	H	LB	S	AOR	5	27	27000
86-2	SLB	H	LB	S	AOR	7	19	19000
86-2	SLB	H	LB	S	FFG	48	31	24800
86-2	SLB	H	LB	S	DDG	24	10	8000
86-2	SLB	H	LB	S	LSD	39	87	69600
86-2	SLB	H	LB	S	DDG	14	90	72000
86-2	SLB	H	LB	S	LST	1186	71	46900
86-2	SLB	H	LB	S	LHA	5	26	26000
86-2	SLB	H	LB	S	FFG	54	78	156000
86-2	SLB	H	LB	S	AVM	1	18	18000
86-2	SLB	H	LB	S	FFG	38	19	19000
86-2	SLB	H	LB	S	FFG	33	39	39000
86-2	SLB	H	LB	S	BB	62	15	15000
86-2	SLB	H	LB	S	CG	49	29	29000
86-2	SLB	H	LB	S	FFG	14	15	30000

APPENDIX C

SAMPLE IMA QUARTERLY ROV FUND REQUEST MESSAGE



UUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUU
U UNCLASSIFIED U
UUUUU UUUUUUUUUUUUUUUUUUUUUUUUUUUUU

1st + 2nd Qtr Grant.
ROV II 1,856,200
ROV I 27,800

3rd Qtr Request
ROV II - 914,800
ROV I -0-

ROUTINE

P 252313Z MAR 85

FM USS CAPE COD

TO COMNAVSURFPAC SAN DIEGO CA

BT
UNCLAS //N07132//

SUBJ: ROV FUNDS REQUEST 3RD QTR FY 85

A. COMNAVSURFPACINST 4400.1D

1. PURSUANT REF A, THE FOLLOWING RPT IS SUBMITTED:
FYDP II REQUIREMENTS

A. ALONGSIDE AVAILABILITIES (ROV DIRECT)

SHIP	INCLUSIVE DATES	WORK DAYS	DAILY RATES	TOTAL EST COST
USS SIDES	APR01-APR09	720	35	25,200
USS SCHENECTADY	APR01-APR12	1440	35	50,400
USS CUSHING	APR01-APR19	1520	35	53,200
USS FORT FISHER	APR08-APR26	2280	35	79,800
USS HOEL	MAY06-MAY17	1440	35	50,400
USS CUSHING	MAY20-JUN07	1520	35	53,200
USS H.W. HILL	JUN03-JUN21	1520	35	53,200
USS INGERSOLL	JUN10-JUN28	1520	35	53,200
USS TEXAS	JUN17-JUN30	2520	35	88,200
USS BERKELEY	JUN17-JUN30	1680	35	58,800
TOTAL:				565,600

B. SHIP TO SHOP AVAILABILITIES (ROV DIRECT)

USS FORT FISHER	APR29-MAY24	1560	35	54,600
USS INGERSOLL	MAY28-JUN28	1280	35	44,800
USS DENVER	MAY28-JUN28	1280	35	44,800
TOTAL:				144,200

C. CONCURRENT AVAILABILITIES (ROV DIRECT)	NONE
D. SELF AVAILABILITY (TAV)	80,000
E. ROVI (ROV INDIRECT)	125,800
GRAND TOTAL FYDP II FUNDS REQUESTED	914,800

BT

72(2)...ACT FOR COMNAVSURFPAC SAN DI(3) 07132/ 1/0474
7-(1)

RTD:000-000/COPIES:0003

APPENDIX D

INTERVIEW QUESTIONS PROVIDED BY RESEARCHER PRIOR TO INTERVIEWS

1. How is an estimate for a ship ROV done from the lowest level to your input to COMNAVSURFPAC?

2. What is included in the cost estimate for a ship ROV (parts, services from outside activities, shop overhead, manhours, etc.)?

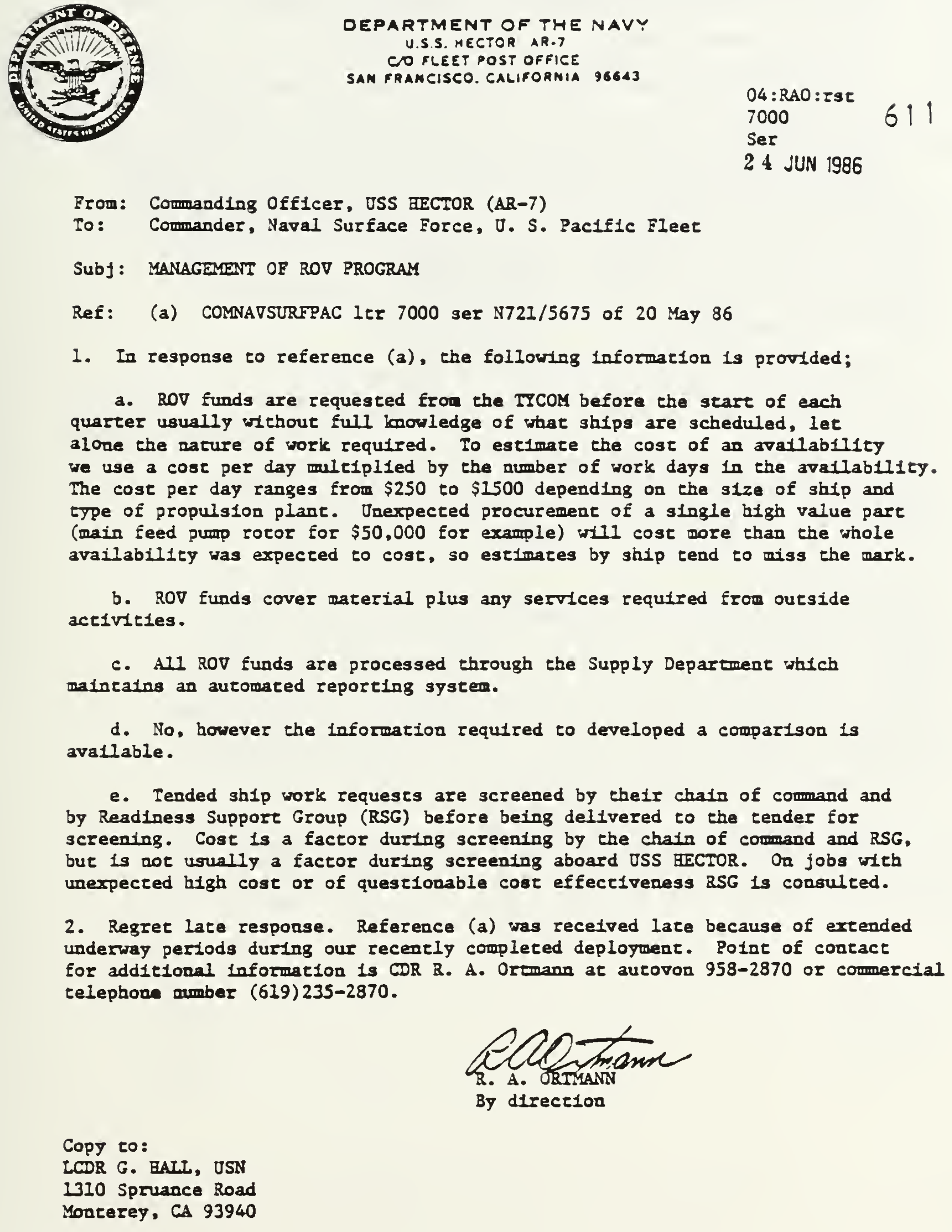
3. How are ROV outlays reported to COMNAVSURFPAC computed for a particular period?

4. Is there any documentation available which compares estimates for ROVs with actual cost of ROV (outlays reported to COMNAVSURFPAC) for each particular ROV?

5. Who screen Work Requests and do they use any financial criteria for acceptance or rejection.

APPENDIX E

IMA SUPPLY OFFICER REPLIES TO QUESTIONS ASKED IN APPENDIX A



DEPARTMENT OF DEFENSE UNITED STATES OF AMERICA

DEPARTMENT OF THE NAVY
U.S.S. HECTOR AR-7
C/O FLEET POST OFFICE
SAN FRANCISCO, CALIFORNIA 96643

04:RAO:rst
7000
Ser 611
24 JUN 1986

From: Commanding Officer, USS HECTOR (AR-7)
To: Commander, Naval Surface Force, U. S. Pacific Fleet

Subj: MANAGEMENT OF ROV PROGRAM

Ref: (a) COMNAVSURFPAC ltr 7000 ser N721/5675 of 20 May 86

1. In response to reference (a), the following information is provided;

a. ROV funds are requested from the TYCOM before the start of each quarter usually without full knowledge of what ships are scheduled, let alone the nature of work required. To estimate the cost of an availability we use a cost per day multiplied by the number of work days in the availability. The cost per day ranges from $250 to $1500 depending on the size of ship and type of propulsion plant. Unexpected procurement of a single high value part (main feed pump rotor for $50,000 for example) will cost more than the whole availability was expected to cost, so estimates by ship tend to miss the mark.

b. ROV funds cover material plus any services required from outside activities.

c. All ROV funds are processed through the Supply Department which maintains an automated reporting system.

d. No, however the information required to developed a comparison is available.

e. Tended ship work requests are screened by their chain of command and by Readiness Support Group (RSG) before being delivered to the tender for screening. Cost is a factor during screening by the chain of command and RSG, but is not usually a factor during screening aboard USS HECTOR. On jobs with unexpected high cost or of questionable cost effectiveness RSG is consulted.

2. Regret late response. Reference (a) was received late because of extended underway periods during our recently completed deployment. Point of contact for additional information is CDR R. A. Ortmann at autovon 958-2870 or commercial telephone number (619)235-2870.

R A Ortmann
R. A. ORTMANN
By direction

Copy to:
LCDR G. HALL, USN
1310 Spruance Road
Monterey, CA 93940

DEPARTMENT OF THE NAVY
USS AJAX (AR-6)
FPO SAN FRANCISCO, CALIF. 96642-2560

1650
70.1/
24 JUN 1986

From: Commanding Officer, USS AJAX (AR 6)
To: LCDR Gary HILL, USN, 1310 Spruance Rd. Montery, CA. 93940

Subj: MANAGEMENT OF ROV PROGRAM

Ref: (a) COMNAVSURPAC ltr Ser 721/5674 dtd 26 May 1986

1. The following information is submitted in response to ROV management questions asked in paragraph 1 of reference (a).

a. The ROV estimate is calculated by determining the total number of scheduled availability days for all ships in the upcoming quarter and multiplying this number by an arbitrary cost factor for each availabilty day (currently $2,100 a day for all ships regardless of ship type or length of scheduled availability). ROVI funding is estimated at 50 percent of the ROV costs. This cost estimate is submitted to COMNAVSURFPAC quarterly.

b. The ROV quarterly estimate is made solely as described in paragraph 1.a. above. This cost estimate is made to predict the costs of ROV/ROVI items as defined in CINCPACFLTINST 7042.1C.

c. ROV obligations are reported monthly. The monthly total is computed by adding the costs of all requistions processed for ROV/ROVI funding during the calendar month. In addition to the monthly expenditures, a total year to date expenditure figure is reported on a monthly basis to COMNAVSURFPAC via the IMMS utilization report.

d. Comparisons of estimated costs to actual costs are not conducted. Information as to which job orders were assigned during a particular upkeep is available as are the costs of all ROV requisitions charged against these jobs orders. The cost of ROVI type materials used cannot be specifically tracked to individual ship availabilities or to job orders. Since final costing of all requisitions/contracts normally takes 30 to 90 days (sometime up to one year) to resolve and not all jobs accomplished for one particular ship, as identified by UIC, need be part of an assigned availability, accurate availability costs can only be obtained with intensive manpower expenditures.

e. All work requested is screened by RSG for assignment to an IMA. The work requests are then processed thru the Production Officer/Repair Officer onboard the IMA. The criteria used for acceptance is based on IMA capacity, IMA capability and material availability not individual job cost.

2. The ROV costs for an individual availability are difficult to accurately estimate and local attempts to do so have proven counter productive. Some of the factors which severly limit accurate individual availability estimates are:

a. Availabilities frequently change in scope and length making any detailed cost estimates accurate only for a very short time.
b. The extent of the work package is not known until 30 days before availability start (at best). Therefore, the quarterly cost estimates required for TYCOM planning must be based on a avearage job package and can not be based upon actual jobs assigned an availabilty.

c. Many jobs are screened to the IMA for units not currently in an avalability and this is a direct ROV cost which can not be accurately estimated.

d. Accurate cost estimates for each availability are not considered paramount. The cost estimating by quarter monitored and updated monthly provides for adequate ROV funding of all work screened for accomplishment. Therefore the basic calculation using total availability days to derive ROV costs works effectively.

R. J. LEMKE
Repair Officer, USS AJAX (AR-6)
By direction

Copy to:
COMNAVSURFPAC, Code 72

DEPARTMENT OF THE NAVY
USS JASON (AR-8)
FLEET POST OFFICE
SAN FRANCISCO 96644-2560

7000
Ser 09/ 765
10 JUN 1986

From: Commanding Officer, USS JASON (AR 8)
To: LCDR G. Hall, 1310 Spruance Rd, Monterey, CA 93940

Subj: MANAGEMENT OF ROV PROGRAM

Ref: (a) COMNAVSURFPAC ltr 7000 Ser N721/5677 of 20 May 86
(b) COMNAVSURFPACINST 4400.1E

1. In response to reference (a) the following information is provided.

a. How is an ROV cost estimate developed for a ship requiring repair? Because the ROV funds request must be submitted prior to the start of each new quarter the Repair Officer usually does not have a copy of the work packages for ships scheduled FRS periods during that quarter. As a result there is no way to base a cost requirement on work that will ultimately be accomplished. Instead, the IMA schedule is reviewed for all availability schedules. It is broken down into the following categories as per reference (b): ships (Active) in operational availabilities (ship to shop), ships (Active) in regular availabilities (alongside), ships (Active) in concurrent availabilities (ROH, SRA), ships (Active) in self availability (applies to tender only). These categories are also required of the reserve force ships as the money is either ROV FYDP II (Active units) or ROV FYDP V (Reserve units) and each has separate accounting requirements. Once the categories are established, the number of work days (M-F no holidays) is computed for each ship and availability. A statistical cost average for ship type/availability type is then multiplied times the number of work days to get a projected availability cost. The statistical cost average is based on historical data for ships tended. If there is a special projected (SHIPALT, MACHALT, FIELD CHANGE, etc) that was known to be planned for a ship class or specific ship then its cost would be added in separately to the funding request. The last category of funding input is the ROV indirect costs of running an IMA. These are the costs for consummables such as hand tools, rags, lubricants etc. This estimate again is based on a historical average for a quarterly basis and may fluctuate up or down depending on the operational schedule of the tender. For example, when the ship is preparing for deployment the ROVI money is used to ensure expected material requirements are on hand prior to deployment as resupply in the Indian Ocean is not real time. Therefore, in this case the estimate will increase. Likewise if the tender is going off line for a period of time the estimate should decrease as FRS work is not being accomplished which would use the consummable materials.

b. What is included in the ROV estimate for each availability? Material costs, shipping charges on open purchase material if known in advance and installation services when part of a contract if cost known in advance. There is no overhead or manhour charges since sailors work and are paid for 24 hour duty on tenders. The post repair data will show what you ended up paying for but does not affect the estimating procedures described in paragraph 1.a. above.

c. How are ROV obligations computed for a particular period before reporting to COMNAVSURFPAC? See paragraph 1.a. above.

d. Is documentation available which compares estimates and actual obligations for each availability? Yes. It can be reconstructed from the SUDAPS tapes but would be time consumming as the tape structure is not configured for that type of sort. The IMMS/ARRS program would also allow you to reconstruct the data.

e. Who screens CSMP/Work requests and is financial criteria used for acceptance or rejection? Cannot address acceptance criteria for initial review of work package at TYCOM level. Once the work package is screened to the tender for review, the acceptance is by the Repair Officer after planning investigates the job. On JASON the financial criteria is taken into account but seldom is the sole criteria for rejection. Operational need and tender loading drive the acceptance process with cost a factor only if it is not realistic for requirement.

M C Morgan
M. C. MORGAN
By direction

Copy to:
COMNAVSURFPAC (N72)

APPENDIX F

DATA FILE ONE

FY QTR	IMA	DEPLY	HOME PORT	TYPE AVAL	SHIP TYPE	HULL #	REPAIR DAYS	EST. COST	SUADPS OBLIG
4	43	0	2	1	11	1195	21	163200	76988
4	43	0	2	1	1	39	17	138400	68375
4	43	0	2	1	10	1070	9	57600	5328
4	43	0	2	1	19	30	8	57600	10714
4	43	0	2	1	20	992	9	64000	6707
4	43	0	2	1	10	1055	9	64000	20436
4	15	0	2	1	20	964	20	16000	5800
4	15	0	2	1	13	5	14	26400	4878
4	15	0	2	1	18	62	68	68000	32700
4	15	0	2	1	6	15	15	11250	721185
4	15	0	2	2	8	36	24	19800	1025
4	15	0	2	2	9	13	33	27225	1789
4	15	0	2	2	16	33	9	6750	2318
4	15	0	2	2	16	41	68	51400	1950
4	15	0	2	2	4	976	68	54400	3863
4	15	0	2	2	10	1058	68	49300	1093
4	15	0	2	2	12	5	57	52725	8660
4	15	0	2	2	17	2	33	24750	145
4	15	0	2	2	16	46	23	17250	5923
4	15	0	2	2	10	1066	24	17400	4484
4	6	0	1	2	2	25	55	82500	5106
4	6	0	1	2	3	7	15	36000	9250
4	6	0	1	2	3	1	55	82500	3637
4	6	0	1	2	15	1	30	45000	138
4	6	0	1	2	3	5	15	22500	12899
4	6	0	1	2	2	24	18	27000	413
4	6	0	1	2	2	22	15	22500	1543
4	6	0	1	2	2	29	9	13500	7071
4	6	0	1	2	3	3	9	13500	180
5	15	0	2	1	11	1186	15	10500	611
5	15	0	2	1	18	62	23	20700	35367
5	15	0	2	1	13	5	10	7000	5323
5	15	0	2	1	12	5	12	9600	24136
5	15	0	2	1	6	15	24	14400	4971916
5	15	0	2	2	16	38	9	6300	158
5	15	0	2	2	16	51	44	30800	1612
5	15	0	2	2	10	1066	63	12600	5974
5	15	0	2	2	16	41	63	44100	3079
5	15	0	2	2	20	976	14	11200	10853
5	15	0	2	2	10	1058	53	10600	5042
5	15	0	2	2	21	1	63	44100	33914
5	15	0	2	2	16	46	44	30800	2547
5	15	0	2	2	16	43	63	44100	226
5	15	0	2	2	16	9	19	13300	18814
5	15	0	2	2	3	5	38	22800	840
5	6	0	2	1	17	1	14	29400	4035
5	6	0	2	1	1	35	10	21000	1543
5	6	0	2	1	22	1050	15	31500	475
5	43	0	2	2	10	1070	24	32240	5710
5	43	0	2	2	19	16	24	32240	8858
5	43	0	2	2	20	973	24	32240	13494
5	43	0	2	2	1	39	24	32240	53053
5	43	0	2	2	13	6	22	23560	9790
5	43	0	2	2	13	10	22	23560	10205
5	43	0	2	2	8	39	22	23560	9144

5	43	0	2	2	12	1	22	23560	6134
5	43	0	2	2	11	1187	22	23560	9693
5	43	0	2	2	9	14	22	24800	7844
5	43	0	2	2	19	21	22	24800	20880
5	43	0	2	2	20	966	22	24800	32453
5	43	0	2	2	20	990	22	24800	20434
5	43	0	2	2	16	37	29	35960	1008
5	43	0	2	2	23	994	44	52080	3626
5	43	0	2	2	19	33	44	52080	7373
5	43	0	2	2	10	1055	44	52080	10395
5	43	0	2	2	16	19	44	52080	92870
5	43	0	2	2	12	3	54	54560	2566
5	43	0	2	2	4	992	54	54560	7594
5	43	0	2	2	1	9	54	54560	6946
5	43	0	2	2	1	36	10	11160	3816
5	43	0	2	2	2	35	10	11160	525
5	43	0	2	2	2	29	10	11160	1711
5	43	0	2	2	3	3	27	31000	4029
5	43	0	2	2	10	1076	43	40920	8190
5	43	0	2	2	9	7	21	12400	5973
6	6	0	2	1	22	1050	6	12000	37284
6	6	0	2	1	19	30	8	16000	13128
6	6	0	2	1	12	3	15	45000	6528
6	6	0	2	1	10	1053	15	30000	11188
6	6	0	2	1	13	7	15	30000	9349
6	6	0	2	1	16	14	9	18000	190
6	6	0	2	1	16	9	12	24000	2187
6	6	0	2	1	16	38	10	20000	1334
6	6	0	2	1	10	1060	12	24000	277
6	6	0	2	1	13	9	10	20000	6740
6	43	0	2	1	22	1051	7	14600	5268
6	43	0	2	1	1	41	16	105500	43034
6	43	0	2	1	10	1065	9	37400	3318
6	43	0	2	1	5	3	16	59200	2157
6	43	0	2	1	20	971	16	59200	868
6	43	0	2	2	1	9	26	30000	3307
6	43	0	2	2	2	25	16	19750	3029
6	43	0	2	2	2	22	16	19750	12703
6	43	0	2	2	1	11	22	26000	1659
6	15	0	2	1	8	36	23	16100	15281
6	15	0	2	1	20	964	23	18400	18862
6	15	0	2	1	16	33	13	9100	6866
6	15	0	2	1	18	62	24	19200	29007
6	15	0	2	1	21	1	15	12000	35134
6	15	0	2	1	12	5	4	3600	29176
6	15	0	2	1	6	15	18	10800	5171907
6	15	0	2	2	16	37	15	10500	97744
6	15	0	2	2	16	41	10	2000	7306
6	15	0	2	2	10	1073	11	7700	445
6	15	0	2	2	24	42	10	7700	285
6	15	0	2	2	16	46	28	5600	643
6	15	0	2	2	10	1066	33	23100	22062
6	15	0	2	2	9	22	11	7700	1399
6	15	0	2	2	3	5	33	19800	11711
7	15	0	2	1	16	38	16	12800	11219
7	15	0	2	1	24	38	25	10000	9657
7	15	0	2	1	21	1	15	12000	5075
7	15	0	2	1	6	15	40	28000	231075
7	15	0	2	1	20	964	17	13600	10639
7	6	0	2	1	25	114	12	36000	30144
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7	43	0	2	1	16	14	7	25200	8503
7	43	0	2	1	11	1185	10	50400	13856
7	43	0	2	1	4	985	29	106400	22764
7	43	0	2	1	8	-0	14	134400	26959

7	43	0	2	1	9	13	12	50400	9736
7	43	0	2	1	20	986	14	53200	8664
7	43	0	2	1	20	990	14	98000	8470
7	43	0	2	1	1	39	11	88200	41826
7	43	0	2	1	9	15	11	58800	3437
7	43	0	2	2	13	9	22	44800	14045
7	37	0	2	2	13	8	12	29280	4876
7	37	0	2	2	10	1076	19	46360	931
7	37	0	2	2	19	33	12	29280	55
7	37	0	2	2	10	1037	19	46360	2133
7	37	0	2	2	2	25	24	58560	692
7	37	0	2	2	26	1	28	68320	58410
7	37	0	2	2	3	1	19	46360	6261
8	43	0	2	1	1	39	5	42000	142852
8	43	0	2	1	9	15	5	42000	17867
8	43	0	2	1	22	1037	10	54600	5342
8	43	0	2	1	9	7	10	54600	20926
8	43	0	2	1	20	971	15	79800	9457
8	43	0	2	1	10	1069	15	79800	22428
8	43	0	2	1	11	1185	20	109200	26395
8	43	0	2	1	1	35	14	113400	34632
8	43	0	2	1	19	23	4	37800	21394
8	15	0	2	1	21	1	17	13600	23671
8	15	0	3	1	6	15	20	14000	1038154
8	15	0	2	1	18	62	14	11200	38261
8	15	0	2	1	3	5	11	8800	23203
8	15	0	2	1	16	37	12	6600	94278
8	15	0	2	2	9	14	41	20500	8024
8	15	0	2	2	16	46	16	6400	445
8	15	0	2	2	3	7	38	22800	14937

APPENDIX G

DATA FILE TWO

FY QTR	IMA	DEPLY	STS DAYS	A DAYS	TOTAL DAYS	EST COST A + STS	MSG. OBLIG	SUADPS OBLIG	TOTAL EST A+STS+TAV
5	43	0	831	0	831	957280	647628	0	0
5	15	0	480	84	564	386700	590757	0	0
5	6	0	0	39	39	141900	394599	0	182900
5	10	0	406	0	404	325800	600515	0	358400
6	43	0	213	64	277	472850	842510	0	0
6	15	0	157	143	300	299000	924644	0	0
6	6	0	0	141	141	517000	849063	374286	675500
6	10	0	571	0	571	513900	634863	10	565290
7	43	0	65	122	187	709200	801163	425950	914800
7	37	0	0	202	202	492880	730574	10	788280
7	15	0	10	113	123	80400	759688	338517	1144600
7	6	0	0	24	24	252000	1232668	518857	1141000
7	10	0	560	0	560	448000	559501	10	492800
8	43	0	0	118	118	705600	1094469	865659	1005600
8	15	0	179	74	253	144700	391191	1138443	567300
8	10	0	366	241	587	469600	585781	10	516560

APPENDIX H

DATA FILE TWO-ONE

FY QTR	IMA	DEPLY	STS DAYS	A DAYS	TOTAL DAYS	EST COST A + STS	MSG. OBLIG	SUADPS OBLIG	TOTAL EST A+STS+TAV
6	6	0	0	141	141	517000	849063	374286	675500
7	43	0	65	122	187	709200	801163	425950	914800
7	15	0	10	113	123	80400	759688	338517	1144600
7	6	0	0	24	24	252000	1232668	518857	1141000
8	43	0	0	118	118	705600	1094469	865659	1005600
8	15	0	179	74	253	144700	1485424	1138443	567300

APPENDIX I

DATA FILE TWO-TWO

FY QTR	IMA	DEPLY	STS DAYS	A DAYS	TOTAL DAYS	EST COST A + STS	MSG. OBLIG	SUADPS OBLIG	TOTAL EST A+STS+TAV
6	6	0	0	141	141	517000	849063	374286	675500
7	43	0	65	122	187	709200	801163	425950	914800
7	15	0	10	113	123	80400	759688	338517	1144600
7	6	0	0	24	24	252000	1232668	518857	1141000
8	43	0	0	118	118	705600	1094469	865659	1005600
8	15	0	179	74	253	144700	1485424	1138443	567300

APPENDIX J

DATA FILE ONE-ONE

FY QTR	IMA	DEPLY	HOME PORT	TYPE AVAL	SHIP TYPE	HULL #	REPAIR DAYS	EST. COST	SUADPS OBLIG
4	43	0	2	1	11	1195	21	163200	76988
4	43	0	2	1	1	39	17	138400	68375
4	43	0	2	1	10	1070	9	57600	5328
4	43	0	2	1	19	30	8	57600	10714
4	43	0	2	1	4	992	9	64000	6707
4	43	0	2	1	10	1055	9	64000	20436
4	15	0	2	1	4	964	20	16000	5800
4	15	0	2	1	13	5	14	26400	4878
4	15	0	2	1	18	62	68	68000	32700
4	15	0	2	1	6	15	15	11250	721185
4	15	0	2	2	8	36	24	19800	1025
4	15	0	2	2	9	13	33	27225	1789
4	15	0	2	2	16	33	9	6750	2318
4	15	0	2	2	16	41	68	51400	1950
4	15	0	2	2	4	976	68	54400	3863
4	15	0	2	2	10	1058	68	49300	1093
4	15	0	2	2	12	5	57	52725	8660
4	15	0	2	2	17	2	33	24750	145
4	15	0	2	2	16	46	23	17250	5923
4	15	0	2	2	10	1066	24	17400	4484
4	6	0	1	2	2	25	55	82500	5106
4	6	0	1	2	3	7	15	36000	9250
4	6	0	1	2	3	1	55	82500	3637
4	6	0	1	2	15	1	30	45000	138
4	6	0	1	2	3	5	15	22500	12899
4	6	0	1	2	2	24	18	27000	413
4	6	0	1	2	2	22	15	22500	1543
4	6	0	1	2	2	29	9	13500	7071
4	6	0	1	2	3	3	9	13500	180
5	15	0	2	1	11	1186	15	10500	611
5	15	0	2	1	18	62	23	20700	35367
5	15	0	2	1	13	5	10	7000	5323
5	15	0	2	1	12	5	12	9600	24136
5	15	0	2	1	6	15	24	14400	4971916
5	15	0	2	2	16	38	9	6300	158
5	15	0	2	2	16	51	44	30800	1612
5	15	0	2	2	10	1066	63	12600	5974
5	15	0	2	2	16	41	63	44100	3079
5	15	0	2	2	4	976	14	11200	10853
5	15	0	2	2	10	1058	53	10600	5042
5	15	0	2	2	21	1	63	44100	33914
5	15	0	2	2	16	46	44	30800	2547
5	15	0	2	2	16	43	63	44100	226
5	15	0	2	2	16	9	19	13300	18814
5	15	0	2	2	3	5	38	22800	840
5	6	0	2	1	17	1	14	29400	4035
5	6	0	2	1	1	35	10	21000	1543
5	6	0	2	1	22	1050	15	31500	475
5	43	0	2	2	10	1070	24	32240	5710
5	43	0	2	2	19	16	24	32240	8858
5	43	0	2	2	4	973	24	32240	13494
5	43	0	2	2	1	39	24	32240	53053
5	43	0	2	2	13	6	22	23560	9790
5	43	0	2	2	13	10	22	23560	10205
5	43	0	2	2	8	39	22	23560	9144

5	43	0	2	2	12	1	22	23560	6134
5	43	0	2	2	11	1187	22	23560	9693
5	43	0	2	2	9	14	22	24800	7844
5	43	0	2	2	19	21	22	24800	20880
5	43	0	2	2	4	966	22	24800	32453
5	43	0	2	2	4	990	22	24800	20434
5	43	0	2	2	16	37	29	35960	1008
5	43	0	2	2	23	994	44	52080	3626
5	43	0	2	2	19	33	44	52080	7373
5	43	0	2	2	10	1055	44	52080	10395
5	43	0	2	2	16	19	44	52080	92870
5	43	0	2	2	12	3	54	54560	2566
5	43	0	2	2	4	992	54	54560	7594
5	43	0	2	2	1	9	54	54560	6946
5	43	0	2	2	1	36	10	11160	3816
5	43	0	2	2	2	35	10	11160	525
5	43	0	2	2	2	29	10	11160	1711
5	43	0	2	2	3	3	27	31000	4029
5	43	0	2	2	10	1076	43	40920	8190
5	43	0	2	2	9	7	21	12400	5973
6	6	0	2	1	22	1050	6	12000	37284
6	6	0	2	1	19	30	8	16000	13128
6	6	0	2	1	12	3	15	45000	6528
6	6	0	2	1	10	1053	15	30000	11188
6	6	0	2	1	13	7	15	30000	9349
6	6	0	2	1	16	14	9	18000	190
6	6	0	2	1	16	9	12	24000	2187
6	6	0	2	1	16	38	10	20000	1334
6	6	0	2	1	10	1060	12	24000	277
6	6	0	2	1	13	9	10	20000	6740
6	43	0	2	1	22	1051	7	14600	5268
6	43	0	2	1	1	41	16	105500	43034
6	43	0	2	1	10	1065	9	37400	3318
6	43	0	2	1	5	3	16	59200	2157
6	43	0	2	1	4	971	16	59200	868
6	43	0	2	2	1	9	26	30000	3307
6	43	0	2	2	2	25	16	19750	3029
6	43	0	2	2	2	22	16	19750	12703
6	43	0	2	2	1	11	22	26000	1659
6	15	0	2	1	8	36	23	16100	15281
6	15	0	2	1	4	964	23	18400	18862
6	15	0	2	1	16	33	13	9100	6866
6	15	0	2	1	18	62	24	19200	29007
6	15	0	2	1	21	1	15	12000	35134
6	15	0	2	1	12	5	4	3600	29176
6	15	0	2	1	6	15	18	10800	5171907
6	15	0	2	2	16	37	15	10500	97744
6	15	0	2	2	16	41	10	2000	7306
6	15	0	2	2	10	1073	11	7700	445
6	15	0	2	2	24	42	10	7700	285
6	15	0	2	2	16	46	28	5600	643
6	15	0	2	2	10	1066	33	23100	22062
6	15	0	2	2	9	22	11	7700	1399
6	15	0	2	2	3	5	33	19800	11711
7	15	0	2	1	16	38	16	12800	11219
7	15	0	2	1	24	38	25	10000	9657
7	15	0	2	1	21	1	15	12000	5075
7	15	0	2	1	6	15	40	28000	231075
7	15	0	2	1	4	964	17	13600	10639
7	6	0	2	1	25	114	12	36000	30144
7	6	0	2	1	9	8	12	36000	23465
7	43	0	2	1	16	14	7	25200	8503
7	43	0	2	1	11	1185	10	50400	13856
7	43	0	2	1	4	985	29	106400	22764

7	43	0	2	1	8	40	14	134400	26959
7	43	0	2	1	9	13	12	50400	9736
7	43	0	2	1	4	986	14	53200	8664
7	43	0	2	1	4	990	14	98000	8470
7	43	0	2	1	1	39	11	88200	41826
7	43	0	2	1	9	15	11	58800	3437
7	43	0	2	2	13	9	22	44800	14045
7	37	0	2	2	13	8	12	29280	4876
7	37	0	2	2	10	1076	19	46360	931
7	37	0	2	2	19	33	12	29280	55
7	37	0	2	2	10	1037	19	46360	2133
7	37	0	2	2	2	25	24	58560	692
7	37	0	2	2	26	1	28	68320	58410
7	37	0	2	2	3	1	19	46360	6261
8	43	0	2	1	1	39	5	42000	142852
8	43	0	2	1	9	15	5	42000	17867
8	43	0	2	1	22	1037	10	54600	5342
8	43	0	2	1	9	7	10	54600	20926
8	43	0	2	1	4	971	15	79800	9457
8	43	0	2	1	10	1069	15	79800	22428
8	43	0	2	1	11	1185	20	109200	26395
8	43	0	2	1	1	35	14	113400	34632
8	43	0	2	1	19	23	4	37800	21394
8	15	0	2	1	21	1	17	13600	23671
8	15	0	3	1	6	15	20	14000	1038154
8	15	0	2	1	18	62	14	11200	38261
8	15	0	2	1	3	5	11	8800	23203
8	15	0	2	1	16	37	12	6600	94278
8	15	0	2	2	9	14	41	20500	8024
8	15	0	2	2	16	46	16	6400	445
8	15	0	2	2	3	7	38	22800	14937
8	15	0	2	2	16	38	10	4000	109450

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